APRIL, 1950 Vol. 39, No. 4

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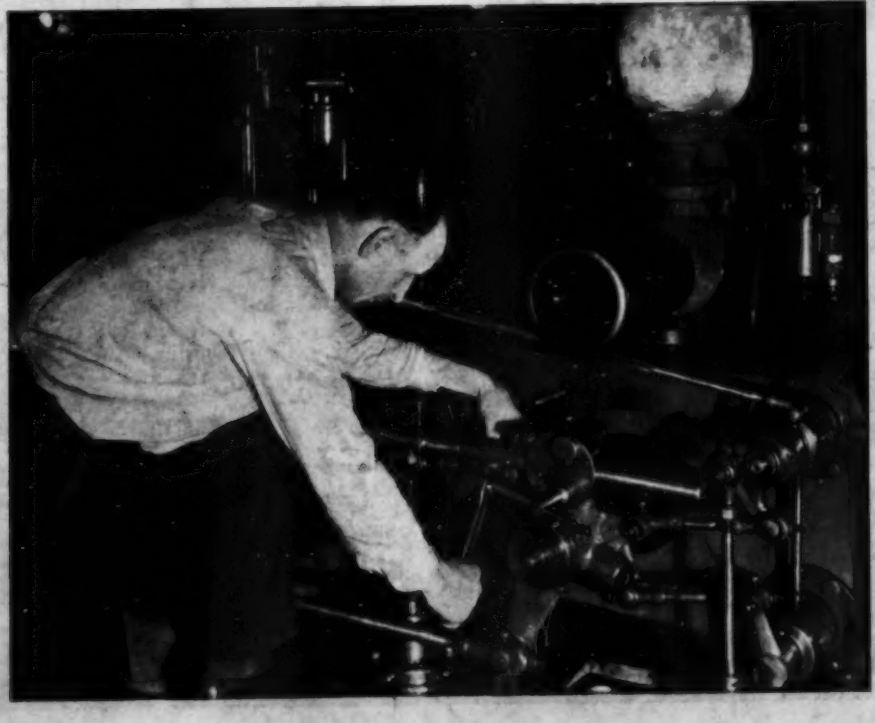
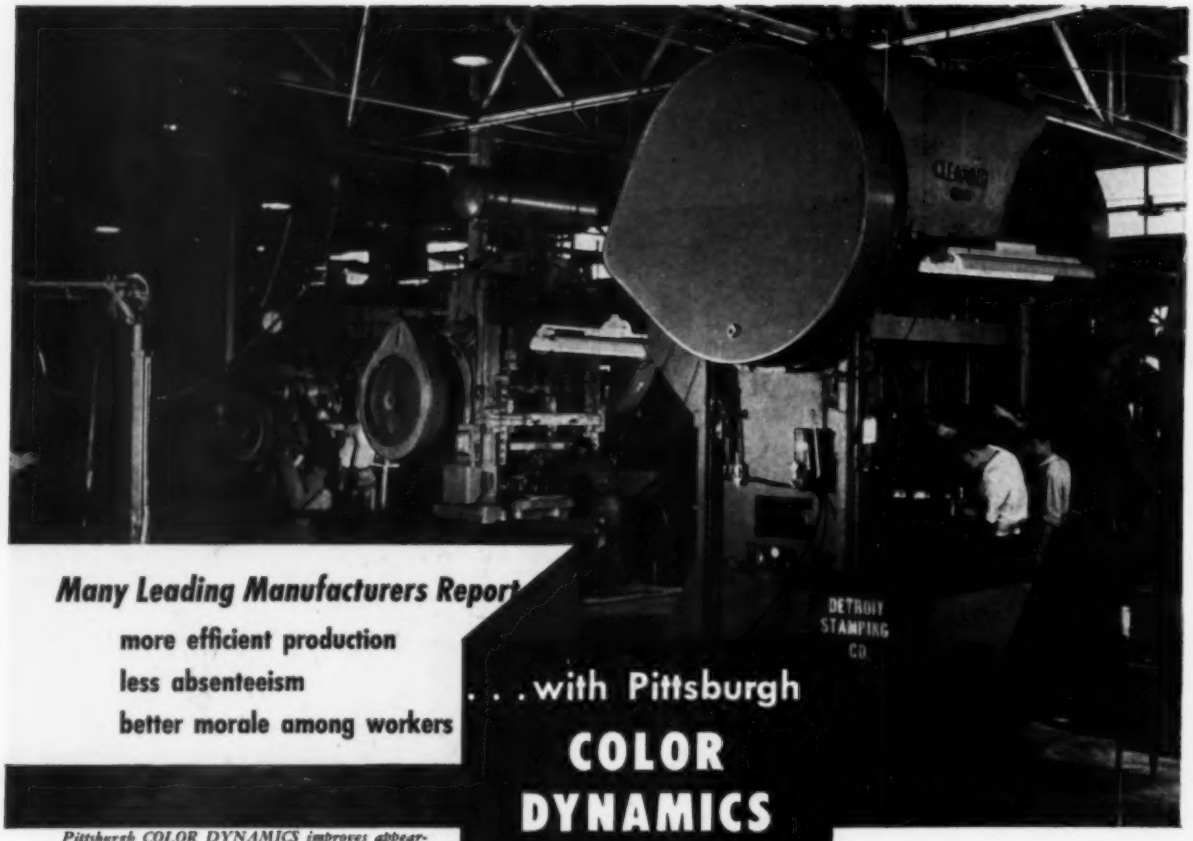
The Shop Teachers' Professional Magazine

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION





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more efficient production
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Tomorrow's skilled shopmen must know how this modern scientific painting system improves production techniques

MORE AND MORE, executives in industry are recognizing the influence of physical and psychological factors upon workers and their output.

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● **Besides a knowledge** of metals, machines and methods, the skilled shopman and production executive of tomorrow must also know how to make use of color in order to turn out more and better work.

Many industrial and vocational training schools are including the study of COLOR DYNAMICS in their training courses.

● **COLOR DYNAMICS** is a complete and comprehensive painting system which makes use of the *energy in color* to improve the quantity and quality of production. Science has established the fact that this energy has a marked influence upon the physical, mental and nervous systems of human beings.

In COLOR DYNAMICS, colors are classified according to this influence upon people. *Focal* colors lessen eye fatigue and nervous tension. *Eye-rest* colors relax the eyes of the worker. *Morale-building* colors promote cheerfulness and restrain mental depression. They promote better relations between workers and management. *Safety* colors reduce accident hazards by warning of impending danger.

● **Begin now to teach** your students COLOR DYNAMICS. For a practical demonstration of its benefits, paint the walls, floors, ceilings and machines of your manual training rooms according to this method. You'll be pleased with the results.

For a complete explanation of what Pittsburgh COLOR DYNAMICS is and how it works in industry send for our free, profusely illustrated booklet. Packed with interesting data, it makes an excellent textbook for your classes.

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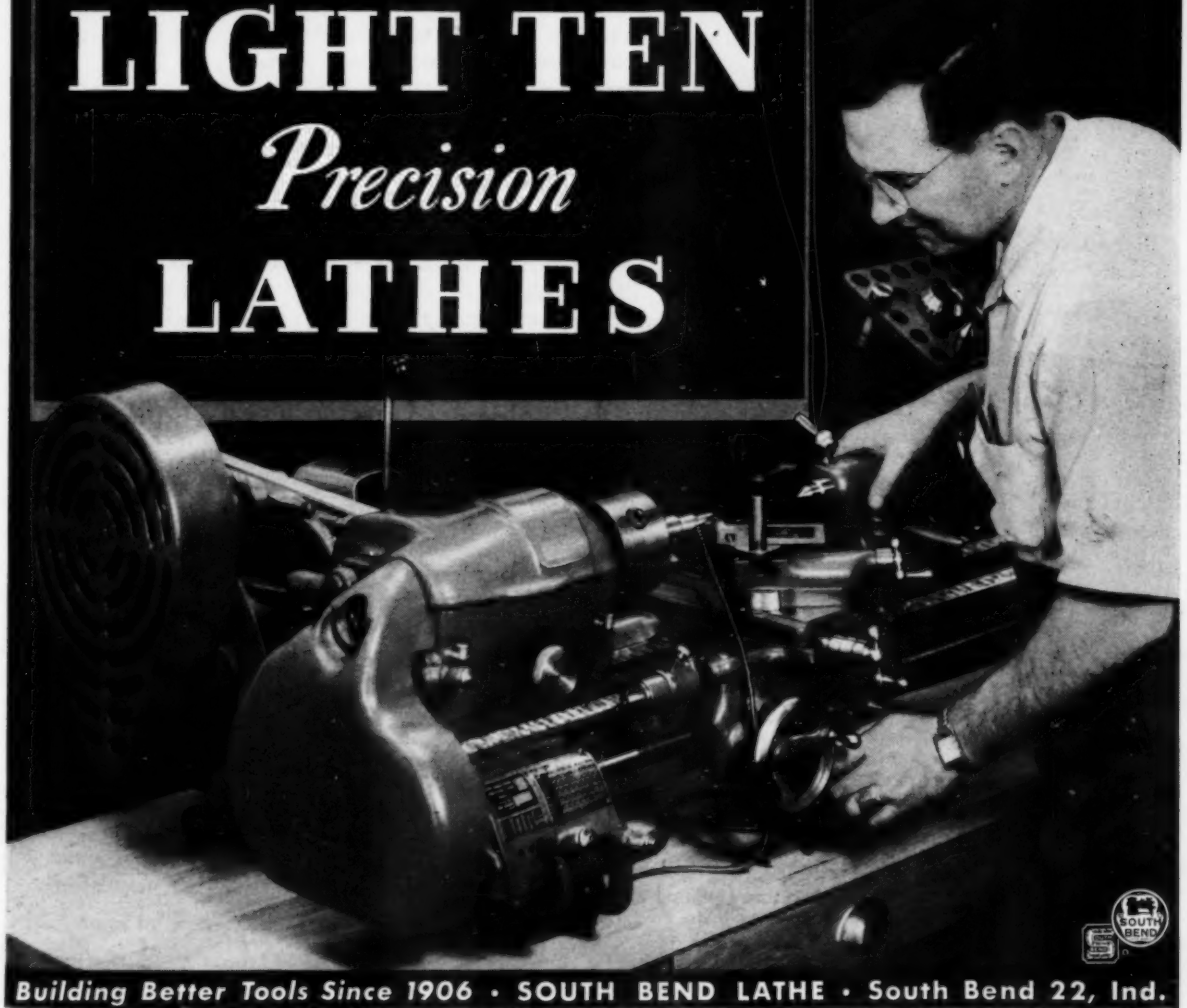

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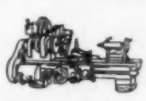
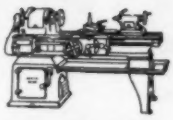
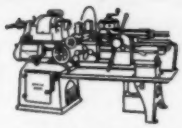
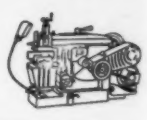

☐ 9" and 10" BENCH LATHES


☐ 10" to 16-24" FLOOR LATHES


☐ 1/2" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES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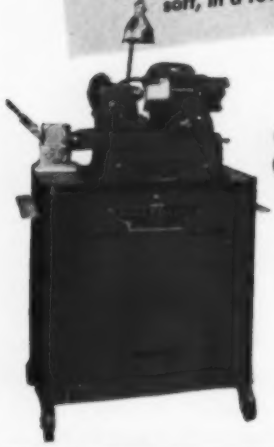

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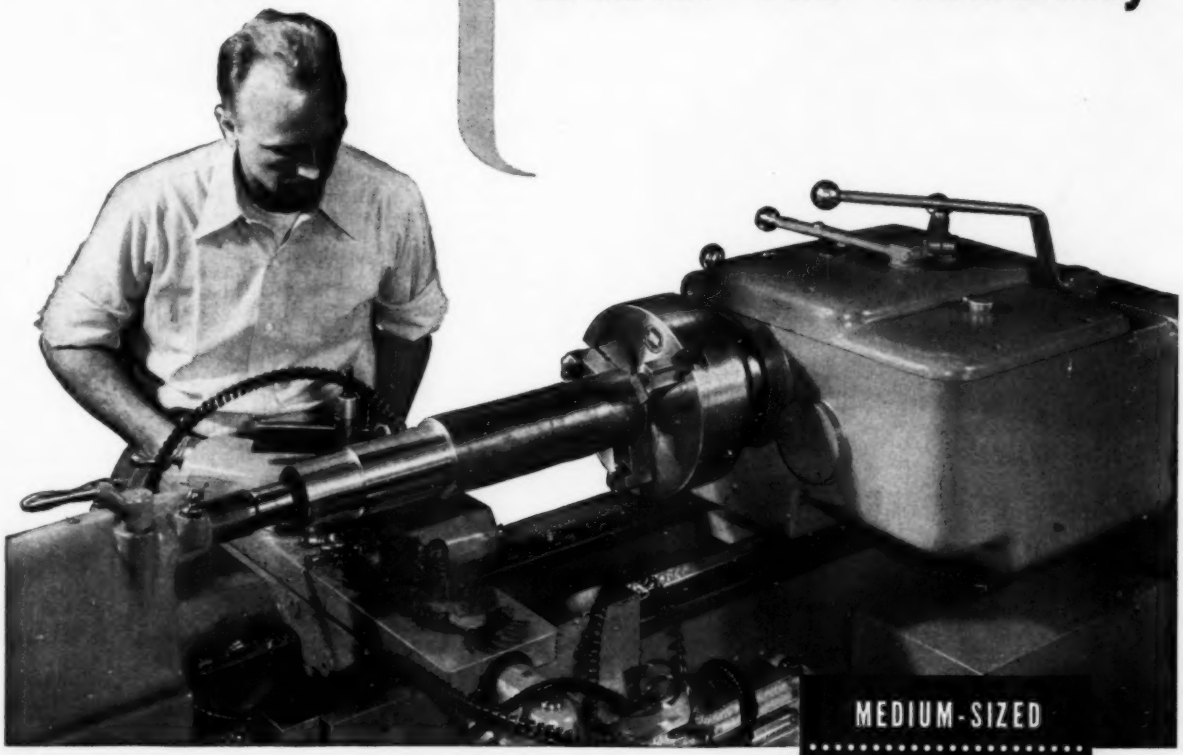

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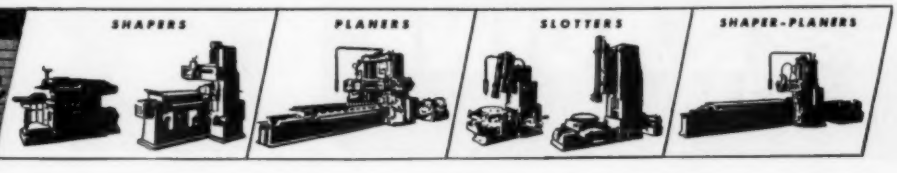

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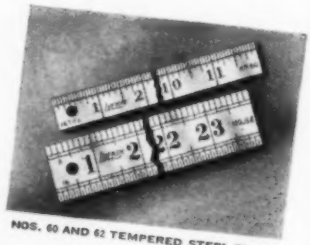

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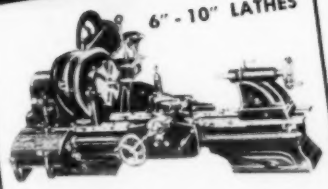
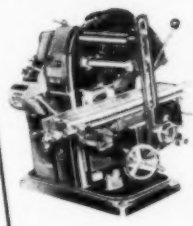
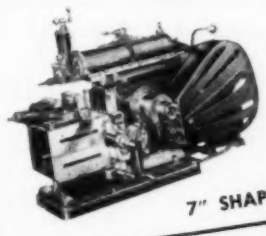
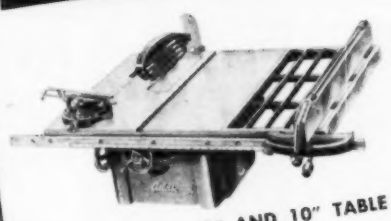

6" - 10" LATHES

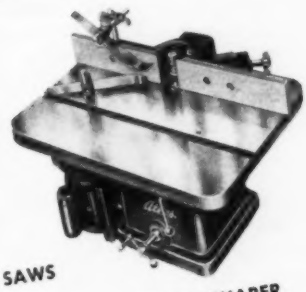

MILLING MACHINES

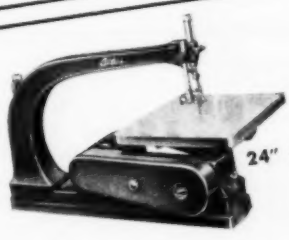
BENCH AND FLOOR DRILL PRESSES

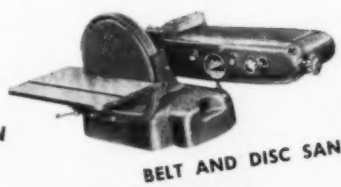

7" SHAPER

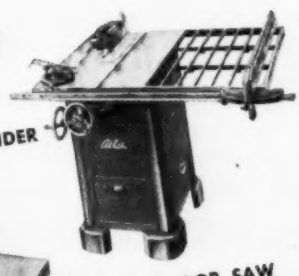
WOODWORKING

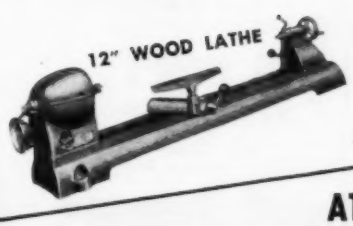

8" AND 10" TABLE SAWS


WOOD SHAPER


24" JIG SAW


BELT AND DISC SANDER


10" FLOOR SAW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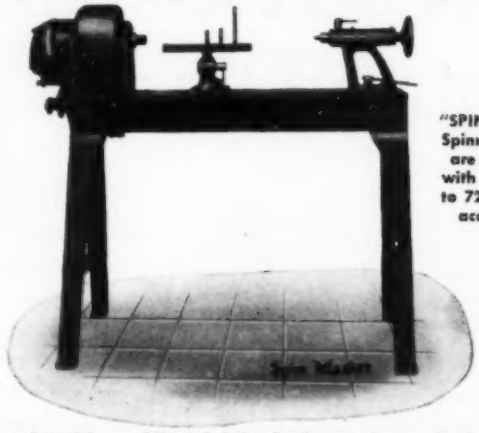

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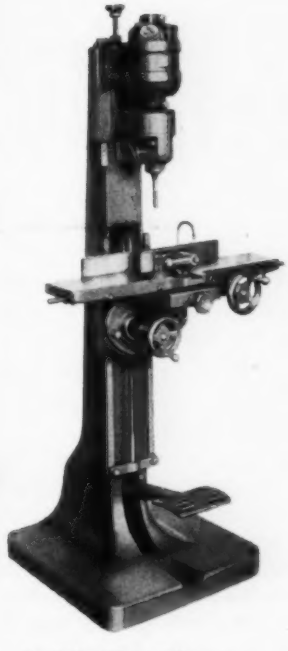

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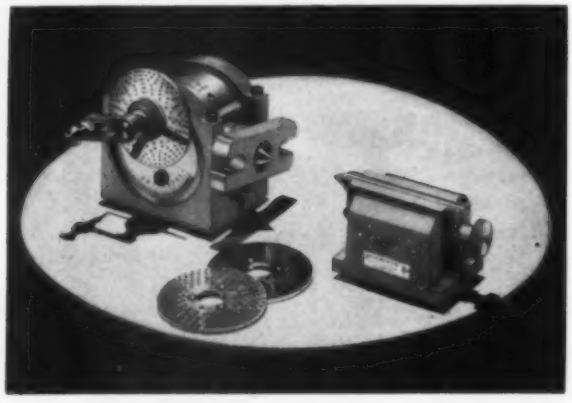

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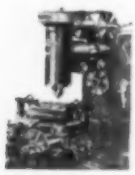

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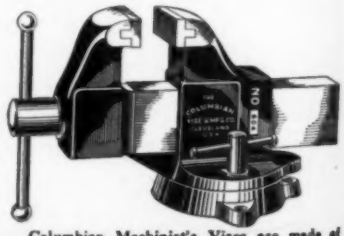

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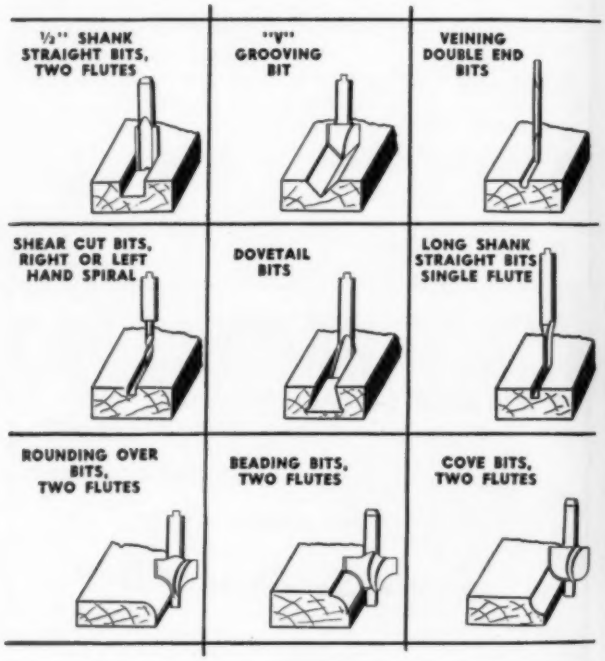
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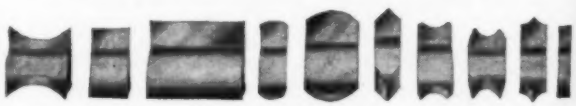

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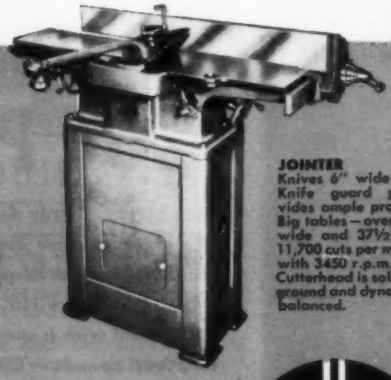

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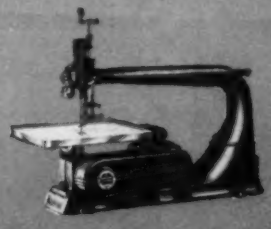

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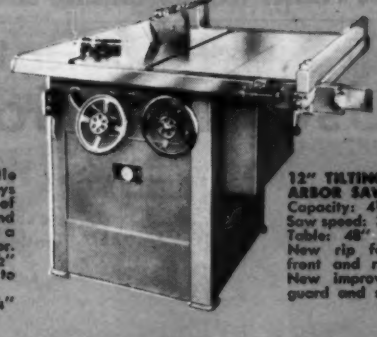

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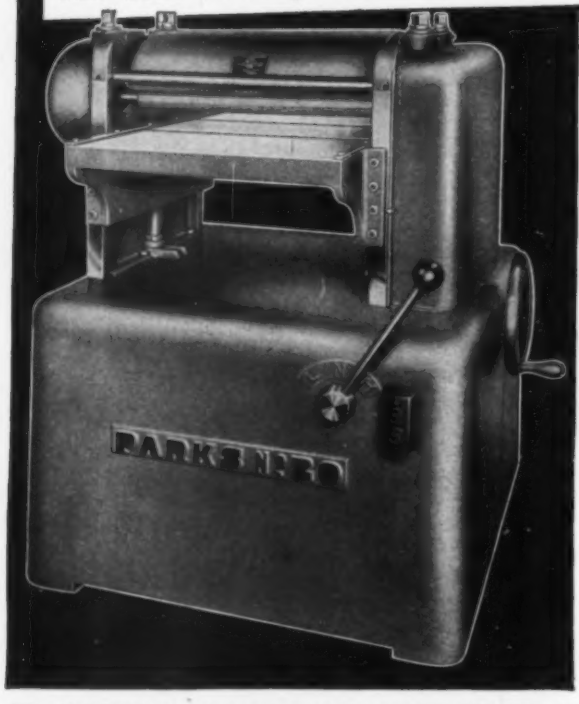

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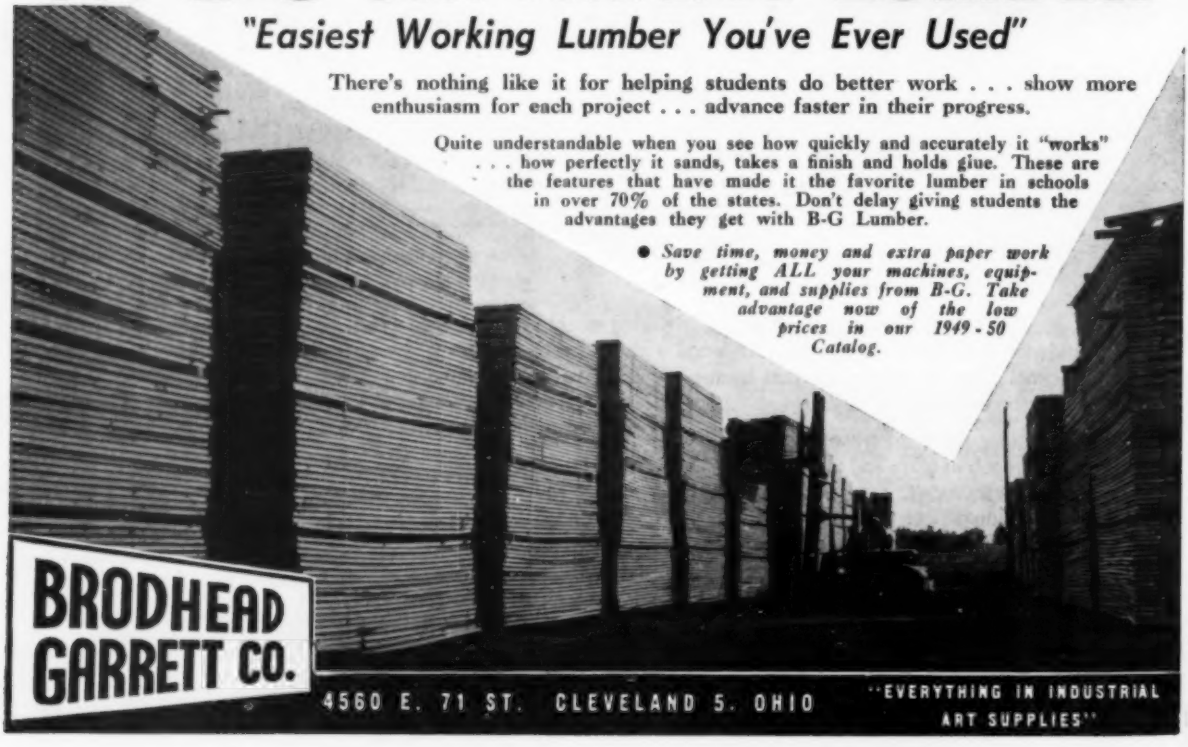

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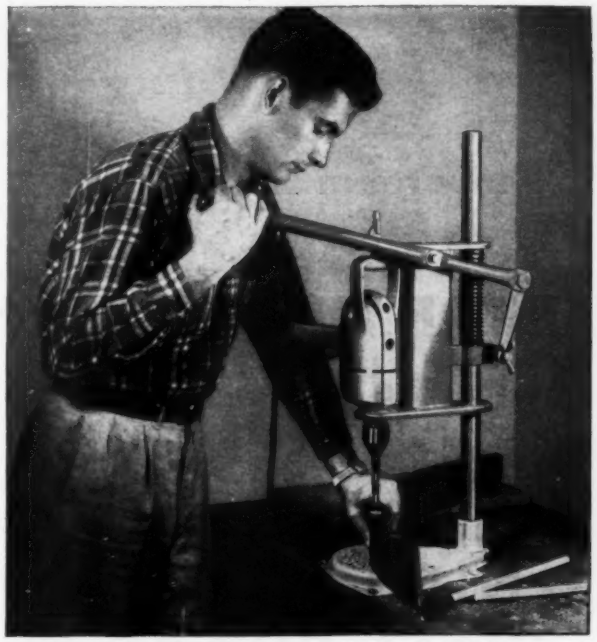

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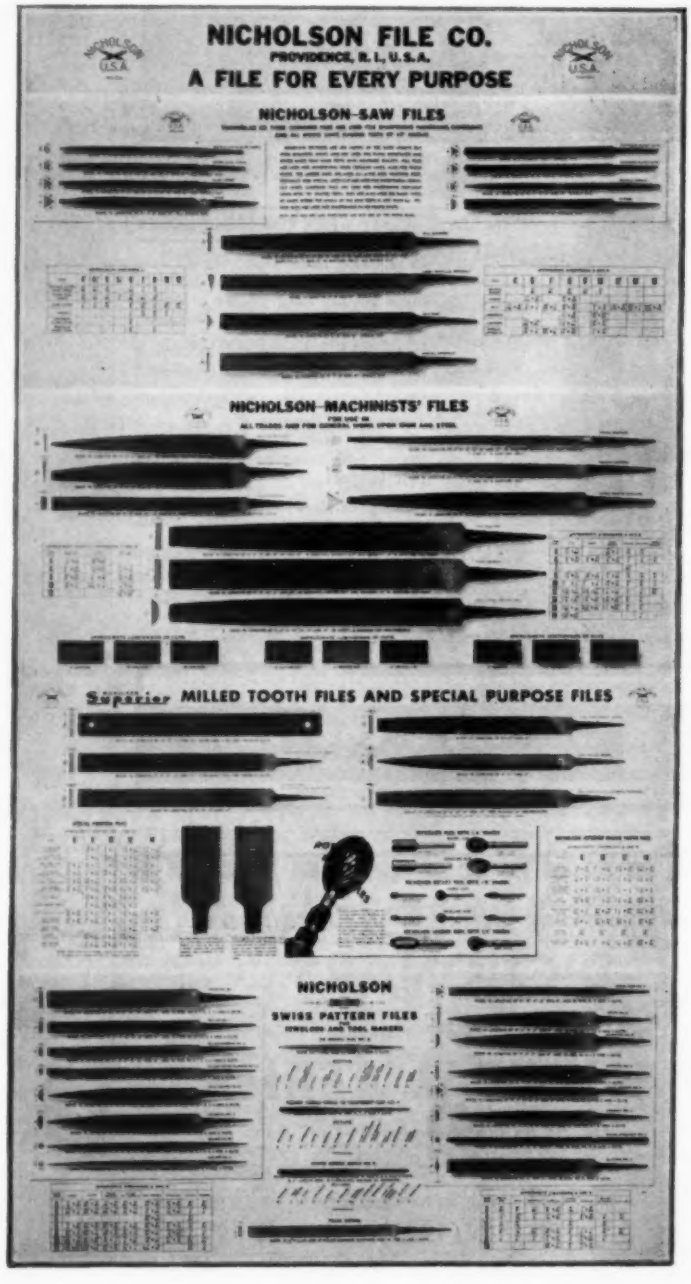

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Colorado A. & M. College, Fort Collins, Colo. June 19–July 14, and July 17–August 11.

Cornell University, Ithaca, N. Y. July 3–August 12.

Oregon State College, Corvallis, Ore. June 19–August 11.

Oswego State Teachers College, Oswego, N. Y. July 5–August 11, July 5–28, July 31–August 25. Driver Training, August 21–September 1.

Pennsylvania State College, State College, Pa. June 13–30, July 5–August 11, August 14–September 2.

Southern California, June 26–August 4, August 7–September 1.

The Stout Institute, Menomonie, Wis. June 19–July 28.

Texas A. & M. College, College Station, Tex. June 5–July 15, July 17–August 25.

University of Minnesota, Minneapolis 14, Minn. June 12–July 22, July 24–August 26.

Wayne University, Detroit 1, Mich. Six, eight, or ten weeks, starting June 26.

This Month's Cover

The picture chosen for the April, 1950, cover of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION shows a student of the evening steam engineering course at the Milwaukee Vocational School, Milwaukee, Wis. He is making adjustments on the valve gear of a Corliss engine. There are many of these engines still in operation, although there are not many made any more.

At one time the Corliss engine was the most efficient steam engine built, but the steam turbine now outranks it in many ways.

The photograph was submitted by Robert W. Tarbell, first vice-principal of the Milwaukee Vocational School, to be used as an illustration for his article, "Upgrading Evening School Instruction," which appears on pages 144–147 of this issue.

Coming Conventions

Apr. 3–6. **Western Arts Association**, at Chicago, Ill. Headquarters, Palmer House. Secretary, George S. Dutch, George Peabody College for Teachers, Nashville 4, Tenn.

Apr. 10. **New York State Steering Committee for Industrial Arts**, at New York City. Headquarters, Hotel Commodore. Secretary, Frederick Findeldey, Violet Ave., Hyde Park, N. Y.

Apr. 10–13. **New York State Vocational and Practical Arts Association**, at New York City, Headquarters, Hotel Commodore. Secretary, Dr. R. S. Knouse, New York State Teachers College, Albany 3, N. Y.

Apr. 12–15. **Eastern Arts Association**, at New York City. Headquarters, Hotel Statler. Secretary, Mrs. Lillian D. Sweigart, State Teachers College, Kutztown, Pa.

Apr. 14. **Industrial Education Conference**, at Ames, Iowa. Headquarters, Memorial Union. Chairman, Lowell Carver, 220 Curtiss Hall, Iowa State College, Ames, Iowa.

Apr. 14–15. **Florida Industrial Arts Association**, at Miami, Fla. Secretary, David L. Readick, 830 Jefferson Ave., Lakeland, Fla.

Apr. 20–22. **Michigan Industrial Education Society**, at Grand Rapids, Mich. Secretary, Maurice C. Overholt, 316 S. Fifth St., Grand Haven, Mich.

Apr. 21–22. **West Virginia Branch, American Vocational Association**, at Jackson's Mill, W. Va. Headquarters, Mt. Vernon Hall. Secretary, Dwight Fowler, Bridgeport, W. Va.

Apr. 21–22. Fourth annual conference of the **Louisiana Industrial Education Conference**, at Natchitoches, La. Headquarters, Northwestern State College. Secretary, Walter J. Robinson, professor of industrial education, Northwestern State College.

Apr. 26–29. **Southeastern Arts Association**, at New Orleans, La. Headquarters, Hotel St. Charles. Secretary, Miss Ruth Harris, 111 West 11th Ave., Johnson City, Tenn.

Apr. 27–29. **Indiana Industrial Education Association**, at Marshall, Ind. Headquarters, Turkey Run Inn. Secretary, H. G. McComb, 215 State House, Indianapolis, Ind.

VOL. 39, NO. 4 APRIL, 1950

Industrial Arts and Vocational Education

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

THE BRUCE PUBLISHING COMPANY
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Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

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-IAVE-
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Notes on the Historical Aspects of the General Shop

ARTHUR B. MAYS
Professor of Industrial Education
University of Illinois
Urbana, Ill.

When one attempts to discover the beginning of what is now commonly referred to as the "General Shop" he immediately becomes aware of the intimate relationship of the general-shop idea to that of the junior high school. Indeed, it seems clear that originally the general shop was little more than the industrial-education phase of the junior high school movement. The educational theories that brought to birth the junior high school also produced the demand for some kind of program of *diversified* shop experiences for junior high school pupils. Any consideration, therefore, of the historical aspects of the general shop must begin with a review of the concepts and influences underlying the development of the junior high school.

One of the earliest and certainly one of the most influential books dealing with the junior high school is Koos's "The Junior High School," published in 1920. He showed that the reorganization of the schools that produced the new type of intermediate school including the seventh, eighth, and ninth grades, followed by a senior high school of three years, while not specifically recommended by the Committee of Ten on Secondary Schools in 1893, was implied by the report of that committee. He further showed that one of the members of the Committee on Economy of Time in Education, reporting in 1913, specifically recommended the junior high school organization in an individual report —"the sort of reorganization which was at the time of the preparation of the report finding place in a number of school systems."[1]

[1]Koos, Leonard V., "The Junior High School" (New York: Harcourt, Brace and Howe, 1920), pp. 4–8.

The Junior High School

In his study of the "peculiar functions" of the junior high school, as expressed by educational leaders, Koos found the five functions ranking highest in frequency of appearance in their replies were: (1) retention of pupils, (2) economy of time, (3) recognition of individual differences, (4) exploration for guidance, and (5) vocational education. It is clear throughout available printed discussions of the general shop that most of these concepts are basic in the thinking of nearly all writers, particularly "exploration for guidance." Throughout the history of the junior high school to the present a major emphasis seems to have been "exploration," and it is, therefore, not surprising to find a corresponding stress on exploratory purposes in the early diversified programs of shop experiences that later came to be called "general shops." However, leaders in the field of industrial arts rarely failed to express other educational ends, as well, in advocating the diversified program of shopwork.

As the concept of exploration came increasingly to be stressed for boys of the seventh, eighth, and ninth years of school, it became apparent to many leaders that the prevalent wood and metal shops of the larger schools and the single woodshop of the smaller schools were inadequate. If explorations of interests and of industries were to be provided, an extensive offering of shop experiences was necessary. Much attention was given during the early years of this century to a careful re-examination and re-evaluation of the manual training inherited from the closing decades of the nineteenth century. As the emphasis shifted from Goetze's "hand and eye training" and Woodward's "education of his hands as well as his head," to Bonser's "study of the changes made by man in the forms of materials to increase their values, and of the problems of life related to these changes," it was clear that a different organization of the curriculum was indicated. In an article written in 1909 dealing with "Industrial Training in the Grade Workshop," Charles F. Smith wrote: "We may consider productive machines in their social relations and classify them under five heads according as they are used for food, clothing, shelter, transportation, and communication." He then suggested what should be studied and made in the shop under each classification. For example, "Under shelter may be considered machines used in building construction and in the production of building materials. Among these are the excavating machine, derrick, crane, and elevator. Materials may be studied under separate heads, as iron and steel, lumber, brick, and tile, paints, stone and glass. Under this head we may also place the electrical, heating, and lighting apparatus. . . . The best opportunities under the head of communication seem to be in the construction of telegraph and telephone instruments, paper, and bookmaking, printing and photography." After elaborating each area of his classification and suggesting also factory visitations by organized pupil groups he said: "The above methods of attacking industrial projects are carried out successfully in one of our best Eastern schools."[2] This clearly is a different approach to a consideration of the function, character, and aims of educational shop courses from the then prevalent manual-training, or manual-arts, courses in the schools. Several leaders interested in the reorganization of the manual-training courses in the upper grades were advocating a similar approach to the development of an enriched type of shopwork that later came to be called industrial arts. Among these leaders were Dean James E. Russell of Teachers College, Columbia University, and Professor F. G. Bonser of the same

[2]Smith, Charles F., "Industrial Training in the Grade Workshop," *Manual Training Magazine*, Vol. X, No. 4, April, 1909, pp. 326–330.

institution. While they were chiefly concerned with elementary industrial arts, their underlying concept of the needed type of shopwork was clearly that of the junior high school and they exerted great influence upon the development in the junior high school program of a diversified offering of industrial-arts experiences.

Exploratory Function of the Junior High School

The concept of industrial arts as a phase of the exploratory function of the junior high school was invariably accompanied by the idea of an enrichment of the "educative" or informational content of the courses. Both the ideas of exploration and of understanding the processes, the social and economic meaning, the materials, and products of modern industry, made emphatic the necessity of as large variety of industrial activities as possible in the junior high school. It was this necessity of experience with numerous materials and processes that was the immediate cause of the appearance of the general or diversified shop. From the beginning of the development, in the area of industrial arts, that came to be known as the general shop, and that came to be identified chiefly with the development of the junior high school, the emphasis was invariably upon a relatively large number of diversified industrial experiences.

In 1916 R. H. Rogers, one of the leaders in industrial arts in the Middle West, writing in the *Industrial Arts Magazine*, described a one and one-half year trial of a plan wherein boys in the sixth, seventh, eighth, ninth, and tenth grades were given introductory courses in 16 different industrial subjects. He wrote: "Each year is divided into four quarters and each grade into four sections, which meet daily for two hours. In the four-year period every boy has participated and gained experience in 16 distinct lines of work."[3] In 1917 Clyde A. Bowman in an article on "Industrial Education for the Smaller Community" wrote: "To give the boy a chance to discover his aptitudes and inaptitudes, his likes and dislikes, through departmental work and varied activities differentiated to meet the variabilities on the part of the pupils; to give him industrial insight and intelligence; to provide an easier transition from the elementary to the secondary period and thus eliminate the loss of pupils from school — these are the aims set up for the junior high or intermediate school. The work is to be educationally stressed rather than chiefly for training. The boy is to be allowed to sample, to have a chance for 'self-discovery.' Textbooks are coming out planned for classwork in 'occupations' just as there is classwork in history."

Junior High School and the General Shop

"It seems logical to assume that each of the subjects within the junior high school should have for its aims those which are held for the school as a whole. If this be true, the 'manual training' work as usually conducted will be in line for decided reorganization and amplification in at least the same degree as are other subjects of the seventh, eighth, and ninth years." He then suggested that in the smaller schools where only one shop is possible a program of diversified activities should be organized, and after showing in detail how it could be done, he said: "This winter Teachers College, Columbia University, is equipping a room as a demonstration shop for industrial-arts work on such a plan for junior high school."[4]

In 1918, evidently basing his statements upon the experience of the diversified activities program carried on in the Menomonie, Wis., schools previously referred to in Mr. Rogers' article, Professor Buxton, then of The Stout Institute, wrote: "For several months the matter of teaching many kinds of work in public school shops rather than a few only, has been discussed in the 'Open Questions' department of the *Manual Training Magazine*. The purpose of this letter is to point to a goal toward which industrial-arts instruction seems to be tending, and apparently must tend in the years just ahead of us. This tendency is in the direction of offering an acquaintance with a variety of industrial occupations as a part of the program of the junior high school, enabling a boy to find himself and helping him somewhat in choosing his future occupation." After urging the need for a variety of industrial experiences he wrote: "The introduction of many kinds of work is not proposed for the development of a considerable degree of skill in each of several mechanical trades. It is urged, however, for an understanding of the elements of several trades while carrying on regular school studies. In every case it is advised that sufficient time be provided for each subject for a grasp of its meaning, for a detailed analysis of selected phases of it, and for practice in certain of its operations."

Later in the article Professor Buxton wrote: "In order to accomplish this purpose it is desirable to have several small shops equipped with tools, machines, and benches, selected for this particular use, with school limitations and industrial needs both in mind. *It is also practicable to combine two or more of such shop equipments in one room, and this arrangement is to be preferred in smaller communities, where one teacher will handle more than one subject.*"[5]

A. H. Edgerton writing in 1919 describes in some detail an experimental general-shop teaching project at the junior high school level in Lincoln School, Teachers College, Columbia University. The purposes of the course as expressed by Edgerton are those mentioned by Bowman in his description of the shop he developed at Teachers College. With reference to the physical arrangements Edgerton wrote: "Because of the added advantages in having a great variety of materials, tools, and machines available in one room for immediate use, and also because of the greater opportunity for observing many distinct types of construction work, a general workshop plan was developed in preference to a number of separate, specialized shops."[6]

Unit Shop vs. General Shop

By 1922 there was much controversy among industrial-arts leaders and teachers concerning the relative values of the general shop and the plan of rotating pupils among several unit shops. Some leaders also continued to argue for the values of thorough work in woodwork or metalwork as contrasted with brief contacts with numerous industrial materials and processes. There was a growing tendency, however, to advocate the general or diversified shop where only one shop could be provided in the smaller schools. Kenneth V. Carmen reported a study of industrial arts in junior high schools in 1922 that indicated that while there was much disagreement over the relative merits of separate or unit shops and diversified shops, "a large majority of those answering the inquiry are in favor of one shop in which all phases or units of industrial activities should be carried on," in smaller communities up to 15,000 population. "For cities from 15,000 to 50,000 a majority favor separate shops, however, the preference for separate shops is not so decidedly marked for cities of this size as is the case for larger cities." "For large cities a large majority favor the separate shop."[7]

The difficulties involved in effective teaching by one instructor attempting to

[3]Rogers, R. H., "Introductory Industrial Courses," *Industrial Arts Magazine*, Vol. V, No. 5, May, 1916, pp. 193–195.

[4]Bowman, Clyde A., "Industrial Arts for the Smaller Community," *The Manual Training Magazine*, Vol. 18, No. 5, January, 1917, pp. 177–180.

[5]Buxton, G. F., In "Open Questions," *Manual Training Magazine*, Vol. 19, No. 8, 1918, p. 285 (italics by present writer).

[6]Edgerton, A. H., "Experimental Work in Junior-High School Industrial Arts," *Industrial Arts Magazine*, Vol. 8, No. 7, July, 1919, p. 251.

[7]Carmen, Kenneth V., "Results of an Inquiry Concerning Certain Phases of Junior High School Industrial Arts," *Industrial Arts Magazine*, Vol. 9, No. 7, July, 1922, pp. 251–256.

teach several different types of industrial work at the same time in a single shop early became apparent and caused some to object to the general shop as pedagogically unsound and to point to the work of the unit shop as a far better teaching situation. At the meeting of the Manual-Arts Conference of the Mississippi Valley in November, 1923, the general shop was given much attention by the members, and Charles A. Bennett's report of the meeting indicated the existence of serious objection to the new type of shop by some of those present. He wrote that the Conference "had thrown new light on the possibilities and limitations of the 'general shop' and the methods it implies, and it took a long step toward clearing up the present confusion concerning the objectives, number, the kind of manual-arts courses that belong in the junior high school." He further reported: "In the discussions of the general shop, the statement was made that at its best, today, the general shop 'reduces teaching to assigning problems and checking results' and at its worst it is 'damaging chaos.'" He summarized the discussions as indicating that it could be made effective, but it was not effective at that time.[8]

Who Coined the Name "General Shop?"

The term "General Shop" seems to have come into general use only gradually and to have been created by a process of "spontaneous generation." It is extremely difficult to discover its first use. Its first appearance in the title of an article recorded by the Readers' Guide is that of Earl L. Bedell's, "Household Mechanics and the General Shop," in 1923. The article appeared in *Industrial Arts Magazine* of July in that year, and in August of 1923 the same author published an article entitled, "Methods of Teaching in a General Shop." It seems clear that Bedell in both instances used the terms "Household Mechanics" and "General Shop" as synonymous terms. The term appears with increasing frequency after 1923 and no doubt had been used by many persons much earlier than 1923. Snedden and Warner, writing in 1927, in discussing the theory of Russell and Bonser, which they referred to as "the Industrial-Social Theory, or The Russell-Bonser Plan," pointed out that, "It was established and tried out by Dr. Bonser in 1910 in the Speyer School. The first published course of study on this basis of organization was included in *The Speyer School Curriculum* published in 1913"; and they continue, "As a result, there was created a new type of shop known as a *general* or *composite* industrial shop or laboratory. This type of shop was designed because it more nearly answered the needs and demands of the new theory of organization."[9] The term "General Shop" has continued to be the most commonly used designation of the organization characterized by the offering of several types of shop experiences in one shop under the instruction of one teacher, though the term used in an article by William E. Warner in 1930, "General Laboratory of Industries" is also sometimes used.[10]

Denman Kelley in an article published in 1925 wrote: "The latest child which has been born into the educational family has been christened General Shop, and the infant is just now at the stage when he is making much noise and disturbing the peace of a good many of his neighbors." Then, turning to the name of the new baby he pointed out that, "Since the term 'general shop' has begun to be used rather extensively it becomes necessary to define it and then to hold to this definition in discussing the subject. One source of definition is the opinions expressed by educators speaking and writing on this subject. These are few and widely varied. The term 'general shop' is used in several articles appearing in the *Industrial Arts Magazine* and also in the *Industrial Education Magazine*. The same content as we often find expressed under the caption 'general shop' is discussed in many more articles as industrial arts. Where writers have used the term 'general shop' they have seemed to have two general ideas in mind. One group of educators has meant a round of shop activities by which a boy might spend some time, varying from three weeks to a year, in each of several different shops. The other group of writers mean by 'general shop' a single shop equipped with the tools and machines of several different trades all of which are being taught at the same time." He then reports that on visiting shops that were designated "general shops," he found three types, (1) Household Mechanics, (2) Farm Mechanics, and (3) The Shop Rotation Plan. Kelley then made the interesting comment: "With the demand for vocational education coming from employers and workmen and culminating in the Federal Vocational Act, industrial arts or prevocational education has begun to evolve a new and broader set of aims. It is mainly for this reason that schoolmen have begun to be dissatisfied with the traditional type of industrial arts and to demand something which for want of a better name they have called 'General Shop.'"[11]

Proffitt in the bulletin *The General Shop* of the United States Office of Education, published in 1929, wrote: "Among various plans for industrial-arts work in the junior high school grades, the general-shop plan of organization is particularly adapted to the realization of the objectives as they have been outlined. This is especially true for the work done in the small school, but with proper modifications the plan can be used advantageously in the schools of a large city system."[12]

This brief survey of the published records of the development of what may be called the general-shop idea, and of the gradual acceptance of the special type of organization and course content characteristic of the modern general shop is obviously in no sense a history of the general shop. It does, however, seem to justify a few general conclusions with reference to the educational changes both in thought and school organization that produced this unique means of teaching industrial arts. The general shop is clearly a special phase of the junior high school scheme of school organization. The traditional manual-training unit shop did not seem to be an appropriate means of achieving the "peculiar functions" of the junior high school. The emphasis of that school upon individual differences among pupils, acquaintance with a wide range of industrial materials and products for their consumer values, and particularly upon exploratory experiences for guidance purposes, all implied a shop, or shops, providing a diversified program of offerings. The desirability of making a variety of experiences available to pupils in the small schools that could not have more than one shop suggested inevitably a shop in which one teacher taught pupils to work in several media in a single room at the same time. The frequent insistence upon learning something about numerous important industrial materials, processes, and products but with no special emphasis upon the acquisition of skill in any one kind of industrial work also suggested the general-shop scheme of providing industrial-arts instruction as a phase of general education. One other influence of significance was the prevalent custom of distinguishing sharply between the rapidly growing vocational or trade-training program of the senior high school years and the "general-education" or "prevoca-

[8]Bennett, Charles A., Editorial Comment, *Industrial Education Magazine*, Vol. 25, No. 8, February, 1924, pp. 207, 208.

[9]Snedden, David, Warner, William E., and others, "Reconstruction of Industrial Arts Courses" (New York: Teachers College, Columbia University), Bureau of Publications, 1927, pp. 7–8.

[10]Warner, William E., "Establishing the General Shop," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION MAGAZINE, Vol. 19, Nos. 8, 9, 10, 11, 1930.

[11]Kelley, Denman, "The General Shop as a Junior High School Activity," *Industrial Arts Magazine*, Vol. 14, No. 4, April, 1925, p. 171.

[12]Proffitt, Maris M., "The General Shop," U. S. Dept. of the Interior, Office of Education, Education Bulletin No. 30, 1929.

tional" character of the junior high school years. As one reviews the available literature dealing with industrial arts and with the junior-high school movement appearing during the years bounded approximately by 1910 and 1930, the period of agitation over the question of the introduction of the general shop, he will be impressed by the apparent inevitability of such an organization and of its appropriateness in the junior high school. There are still many problems yet unsolved concerning this type of shop, but in view of the generally accepted objectives of the junior high school, a program of diversified shop experiences seems the only way to play effectively the role belonging to industrial arts in such a school.

Trends in Vocational-Technical Institutes

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Periodically one hears of a new course or different type of school being introduced into our educational program. Some of these courses and schools continue to survive and become a rather permanent part of the training offered our youth. Others are soon forgotten, perhaps because they were not well planned in the beginning or because they failed to meet the needs of society.

Within recent years, more and more is being said about vocational technical training or vocational training on the post high school level.

Vocational technical training is not a new kind of training. Early records show that it was well established in England, France, and Germany in the early part of the nineteenth century and continued to develop into a permanent part of their educational systems.

In this country, the Gardiner Lyceum, established in the state of Maine, 1823, by Benjamin Hale, is credited as the first. Other institutes soon followed, such as the famous Franklin Institute of Philadelphia, Maryland Institute of Baltimore, Rochester Mechanics Institute, and Pratt Institute. Some of the early institutes are still in existence and very well known for their work.

Concurrent with the institute movement, a program of technical education on the college level emerged in the form of schools of science and engineering. Because engineering colleges offered a degree, they became more popular than technical institutes with their two-year programs. Today, however, vocational technical education shows evidence of becoming an educational *movement*. Interest in this field seems to be increasing rapidly with many new programs being established.

Modern Institutes

The technical institute program of today is defined by the Technical Institute Committee of Engineers' Council for Professional Development as follows:

Curricula are technological in nature and lie in the post-high school area. They differ in content and purpose from those of the vocational school on one hand and from those of the engineering college on the other. . . . The purpose is to prepare individuals for positions auxiliary to but not in the field of professional engineering. The curricula are based upon the principles of science, require the use of mathematics beyond high school and emphasize rational processes rather than rules of practice. Curricula are briefer, more intense, and more specific in purpose than collegiate engineering curricula, though they lie in the same general fields of industry and engineering. Their aim is to prepare individuals for specific technical positions or lines of activity rather than for broad sectors of engineering practice. Training for artisanship is not included within the scope of education of technical institute type.

Vocational technical training has been designated by some as semiprofessional and prepares for occupations which lie between the skilled mechanic and the profession.

Technical occupations are found in industry, agriculture, business, personal services, and other fields.

Vocational technical positions often are classified into four kinds as follows:

1. Engineering aids and science aids, such as draftsmen and laboratory assistants.
2. Technical specialists as inspectors and estimators.
3. Technical production and maintenance supervisors.
4. Semitechnical men as salesmen of technical equipment.

Duties of Industrial Technicians

In industry, the technician may be described as one who often performs hand skills involving the use of instruments, rather than tools. The tasks which he performs frequently require a knowledge of applied technical information and industrial processes.

Technical jobs requiring less than four years of college training but more than high school or trade preparation appear in most industries. In a national survey of 22 major industries conducted by the Consulting Committee on Vocational-Technical Training appointed by the U. S. Commissioner of Education in 1944, several hundred pay roll occupations were reported. Typical of the job groups mentioned were: analysts, computers, designers, dispatchers, draftsmen, foremen, methods men, operators of technical equipment, process specialists, specification writers, testers, and many others.

Considering specific industries, it was found that in the automobile manufacturing industry, 39 technical jobs were cited, such as electrical technician, hydraulics technician, pyrometer specialist, X-ray technician, safety inspector, and process specialist.

In the lumbering and wood processing industries, 14 jobs were classified as of the vocational-technical type. Some of these were: boom foreman, floorman, lumber grader, paper tester, pulp tester, shipping clerk, power plant operator, and others.

Similarly, in the area of petroleum and butadiene production, 30 different jobs were mentioned; in pulp and paper manufacturing, 100 jobs; in rail transportation,

23 jobs, all requiring vocational-technical training on the semiprofessional level or two years post high school grade level. It has been estimated that industry could absorb from 25,000 to 30,000 technicians yearly.

It is of interest to note the ratio of technicians to engineers. In 1944, 16 major industries showed a range in the ratio from 2 to 20 technicians to 1 engineer, or an average of 5.2 technicians to 1 engineer for all industries. Of greater interest is the fact that in 1931 the ratio was only 2.7 technicians to 1 engineer, indicating that the ratio over the past 18 years has increased.

The stimulus for the present-day efforts to organize and systematize training and preparation in the vocational technical field may be accounted for by the greatly increased technological content in all phases of vocational life. In the industrial field, new materials, new processes, new machines, and increased precision call for a more capable and competent worker.

Another factor propelling the development of technical institutes is the desire for more education by young adults who do not wish to attend college and take the traditional courses.

There is the factor also of an increasing age level for initial employment based upon the need for greater maturity, knowledge, and skill in the complex jobs of industry.

Then, too, a large number of students are able to profit more from the terminal training in a technical institute than in a four-year college.

Status of Technical Institutes

The present status of technical institutes as revealed by a survey recently conducted by Leo Smith indicated that there was a total of 81 in the country. The enrollment in day classes for men was given as approximately 31,000, and for women, some 1700, or a grand total of approximately 33,000. Attendance in evening classes came to about the same number.

When the institutes were classified according to administrative control, there were found to be six different types, as follows: state maritime academies and federal schools — 3; state and municipal institutes — 17; privately endowed — 10; extension divisions of colleges and universities — 24; proprietary — 24; and Y.M.C.A. schools — 3. Extension divisions of colleges and universities, and proprietary institutes constitute the largest number.

The majority of the institutes are located in the area east of the Mississippi and north of the Ohio River with a scattered few in California and other states. For the most part, they are found in industrial centers.

Typical of the curricula offered in technical institutes are the following: aeronautical technician, aircraft instrument mechanic, building construction, chemical technology, commercial art, dental hygiene, dental laboratory technology, diesel engineering, electronic technician, executive assisting (technical, medical, and legal), hotel catering technology, machine drafting and design, mechanical technology, optical technology, photography, radio technician, retail business management, structural design, technical office assistant, textile technology.

The vocational technical curricula are prepared upon the basis of an occupational analysis. This practice is also used in preparing courses of study in trade and industrial education. Since the duties of a technician vary considerably from one industry to another, it is essential in most instances to make a survey of the occupational fields in need of technicians and then determine the skills and training that constitute the different jobs. It is a common practice to have advisory committees made up of management and labor in planning educational programs.

Allocation of Hours Between Classroom and Laboratory

A rather large percentage of the time in vocational-technical curricula is allocated to laboratory practice. The National Council of Technical Schools in its "Code of Minimum Standards" states that classroom or theoretical instruction shall not be less than 35 per cent of the total number of hours in the course with the emphasis on the teaching of basic principles. Shopwork or laboratory instruction shall be not less than 40 per cent of the total number of hours.

An analysis of the curricula of the five New York State Institutes of Applied Arts and Sciences revealed that an average of 44 per cent of the time in technical courses was allocated to classroom periods and 56 per cent to laboratory courses. Twenty per cent of each course was allocated to general rather than technical subjects.

For the most part, curricula in technical institutes provide for instruction in cultural subjects in an effort to enrich the training program.

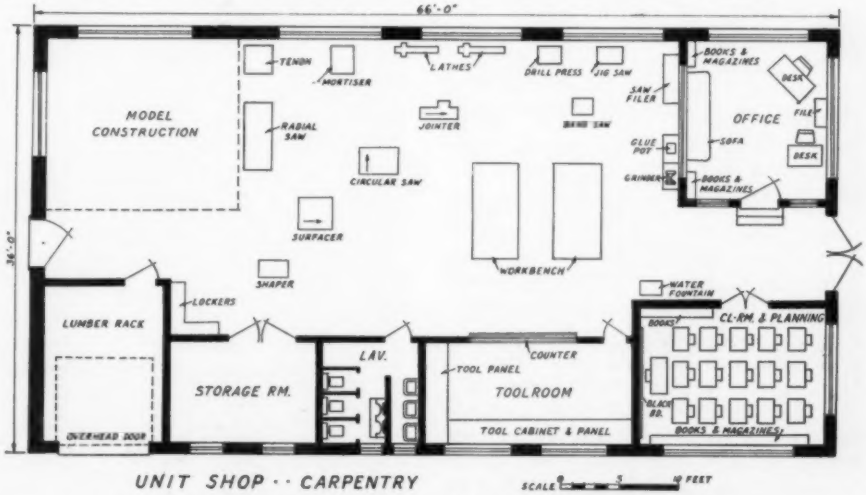
Since laboratory practice forms an important part of most programs, the plant and facilities must be designed for the teaching of basic principles and technological processes. Instruments of various types are needed for most courses.

The methods of teaching used are relatively direct with strong emphasis on doing as distinct from book study. Teachers for vocational-technical classes are chosen primarily on the basis of practical experience, technical knowledge of industry, and knowledge of applied science.

In this age of technological progress and development, the technical institute is helping to fulfill the need for technically trained men. Like our high schools, trade schools, junior colleges, and colleges, there is a definite place for them in our democratic program of education.

WE BEG YOUR PARDON

Unfortunately, an error crept into the heading of Leon E. Falgren's article on page 41 of the February issue. Mr. Falgren is no longer an industrial-arts instructor. His title should have stated that he is the director of industrial arts and vocational education at Kansas City, Kans.



Layout produced by students of the shop planning course, Tuskegee Institute, Ala. Withro McEnge, instructor

Upgrading Evening School Instruction

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People attend evening school voluntarily. They come to learn, and they are free to reject a program that is not satisfactory. And the dissatisfied student does drop out. That is a brief story of a very interesting area in our modern education.

We are living in an expanding age of understanding. A short lifetime ago people bade good-by to study at the end of grammar school or before. Some 10 per cent went on to school, but the rank and file went to work. Hours were long, opportunities for extra activities were scarce, and advancement at work came through experience and diligent effort. Not a bad pattern for the present, too. But our expanding age includes more than understanding. Paralleling more education we have greater physical apparatus, shorter hours, and a greater faith in learning. The man who is informed has considerable prestige in the community. Both employers and employees are seeing more and more that a skilled personnel can be depended on for desirable and sustained production. The evening school contributes a great deal to this better state of affairs. It provides a better economic level for the workman, a more dependable group for the employer and a better citizenry for the community and the state.

The Student Body

Who are the students in an evening school? The range is broad. In the early days it was only natural for the school authorities to set up a program somewhat similar to the day schedule. Classes called English for foreigners, manual training, arithmetic, and the rest came later. As faith in the evening school grew apace, new demands were made. Some seemed a bit fantastic at first. It was not too far fetched to teach bookkeeping, but special accounting courses came slowly. Then income tax courses were added. All this means specially arranged programs to meet special needs. When the evening schools began to see the worth of adapting the programs to meet community needs, they were catching a vision of the larger field of service opening before them.

The students come from areas as broad as the community itself. Tradesmen from many occupations enroll in shopwork to gain additional skill for the daily job. In an age of specialization many skilled craftsmen are proficient in only some of the phases of the trade. They come to school to acquire other techniques and technical knowledge. Some students need to retrain for a new job. Thus, in the field of business education the stenographer or comptometer operator wishes to learn bookkeeping so as to be more proficient for a present or future employer. There are homemakers, bakers, auto drivers and repairmen, electricians, printers, and a host of others. Then, too, there are great varieties of people in a miscellaneous grouping, some improving their understanding of English, while others are following some avocational course. But a classification by subjects is not the whole story. These students are identified by other means. There is a wide range in ages. The young man in his teens works in auto mechanics side by side with the man of sixty. The young lady just looking forward to establishing her home is mastering the fine art of cooking and sewing along with the experienced homemaker, already a grandmother. There is the matter of time out of school. Some have just left a full-time school program while others have been out over four decades. These factors make a great difference in the capacity to learn. People differ in their natural ability. Some can master an idea, understand a problem, acquire a skill much more quickly than others. Add to all this the home situations, the problems arising from employment, or lack of it, the natural attitudes that people have developed over the years, and we have a class composition requiring considerable skill to understand. There are many individual differences in an evening class.

Organization of Classes

Class organization is a problem by itself. You do not take the first 25 who ask for a subject and assign them to a teacher. Their own preferences may be for an advanced class in shopwork, or the second course in accounting, or in machine design. Preferences are subject to review.

Winding an armature in electrical class

A student with a weak background will have some preparatory work to do. The first step is to inform him tactfully where he will need to start. After classes begin, there will be the problem of the accelerated and the retarded students. What will the teacher do when he discovers these differences? If a few students learn at a slower rate than others, they will master less of the material, cover it all less thoroughly, omit whole sections of it and even drop out of class. The teacher has the problem of helping both the retarded and the accelerated student. Some of these problems can be avoided by more careful counseling at the time of registration, but even then variations develop. There is the matter of instructing by groups or by an individual plan. The subject itself will often determine this, but differences in people may not be overlooked. The length of course will determine, in part, the type of class organization. With a short course there is less chance for wide differences to develop. The matter of equipment may be a deciding factor. If there are twenty lathes and twenty students, each can have a machine. But if the same twenty were running tests in a laboratory where only five units of equipment were available, groups of four to a unit might be the solution.

The Evening Faculty

Who are the teachers? Before attempting to describe the teachers, it may be well to lay down some general principles to refresh our minds on the matter of who the ideal teachers are and how we are to recognize them. We are safe in saying that a teacher should be thoroughly grounded in his subject. This may come from experience in the field or from study, depending on the circumstances. If all in the class were beginners and wished only a foundation, less emphasis need be laid on the mastery of the subject and more on ability to teach. This would be the case in teaching beginners in the manual occupations. But if the class contained students who were advanced in certain areas of the subject, they would be asking questions and making statements requiring considerable skill on the part of the teacher. This means that a teacher of an adult evening class must be quite conversant with his field.

An evening teacher must understand adults. This is quite an assignment. Adults vary in many respects, and the teacher needs to develop the proper approach. An adult may ask irrelevant questions and be out of line on many things, including his bigotries, but he is in class and will learn if properly understood. It seems needless to say that the evening teacher must be able to teach. And yet he may fail. Instructing an adult evening class can be quite different from instructing a day class of juveniles.

The evening teacher needs contacts with the outside world. He is dealing with adult students and must understand the atmosphere from which they come. He cannot cloister his mind in academic seclusion and expect to bring a forceful message to his evening class.

Repairing a motor in the auto mechanics department

Problems of Upgrading

There are different approaches to the problem of upgrading instruction in the evening school. Perhaps we should start by defining the term. If we mean acquiring a lot of publicity and gaining the plaudits of the community, perhaps it can be accomplished by a good press agent. If it means glamorizing the program, there is a way to do that. Good buildings and good equipment may also bring a good reputation. But all these things are only contributory. Instruction is upgraded when there is an improvement in all the factors that work together to raise the level of understanding and skill of students. Good teaching is a factor in this upgrading process. We may forget for the moment those external items like equipment, noise, ventilation, etc., all of which have a bearing on the problem, and confine our discussion to improving the skill of the teacher in imparting information, directing the activities of students, inspiring them to better activity and keeping an orderly classroom. There are other important points but these few will illustrate.

The teacher is to be made more skillful. We start with him, his varied interests, his time pattern, his needs. In what is he deficient? It may be in academic or professional preparation, vocational skill or immaturity as a teacher. Perhaps attitudes need to be changed, old biases corrected, or peculiarities of mannerism eliminated. Little personal items can be improved. There is no blanket plan for upgrading teachers.

Upgrading Techniques

Upgrading the staff should start rather soon after appointment. No matter how well prepared the teacher may be, there are in-service training activities to be followed. The evening schools, because of rapid expansion in the past few decades and because of other varying factors, present many reasons for an upgrading program.

a) Some of this can be accomplished by prescribing individual study on the part of teachers. It may be carried on by correspondence, or by an evening course, or by attendance at an approved school during vacations. Thus, a teacher may be skilled in his field, have a natural aptitude for teaching and possess highly desirable personal characteristics. Yet he may need the knowledge and cultural influence to be found in more academic preparation.

b) We can all learn by following a good

Sheet-metal work. Soldering a cornice

Adjusting a Diesel engine

example. The beginning teacher can learn much by observation. This will require some administrative arrangement but will pay dividends.

c) Frequent conferences with other teachers and with the supervisory staff should bring good results. It is well to remember that a conference can be negative if not conducted in the right way. Everyone should gain something from an exchange of experience and opinion.

d) We learn by doing. That is not the whole story, but an instructor does learn much of the fine art of teaching from his daily activities. He finds that one kind of presentation is faulty. He discovers, while he is giving a demonstration, that the equipment is not working well. Then he remembers that he had not checked it beforehand. This experience will, or at least should, improve his practice for the future.

e) In some states and in some localities there is a formal plan of in-service training. This will insure at least a minimum improvement. After that, the teacher is in a position to go forward in special areas.

f) Many. evening school teachers are drawn from a day occupation other than teaching. Specialists in their field of activity who have a good personality and show some aptitude at teaching are often placed in these positions. They would profit by a plan of professional training but cannot leave to go to school, nor do they have time enough to carry on a program of study along with other work. For these people and all who teach in the evening school a series of faculty meetings have proved beneficial. They may be called seminars, conferences, conventions, or institutes. The point is that an assemblage of teachers exchange ideas, are inspired by the meetings and are upgraded in their work. The plan may be for general meetings, workshops, committees, etc. A strong leader in the field of education can bring a helpful message. Questions of classroom management, teaching methods, and many others can be placed before the groups for discussion. Meetings of this kind improve the quality of teaching and produce a camaraderie and esprit de corps among the faculty members. Teachers who come to their classrooms, teach, and go home without the benefit of meetings and interchange of thought, miss a feeling of accomplishment. The institutes are very much worth while.

Results

Evening school teachers shows a great amount of enthusiasm for their work. It is a common remark among them that the evening went by too rapidly. The students show an abundant enthusiasm too, and this inspires the teachers. There are some special reasons why this is so. The sessions are short, from one to three clock hours. The students are adults, attending voluntarily, and are there to learn. To many it is a welcome relief from the daily work. The teachers look upon the assignment as an adventure, and adventures are usually interesting. The institute appeals to them, not only as a means of improvement, but also because there is an adventuresome approach to their jobs. Teachers who are engaged in some practical occupation in the daytime and who have not taken much professional training for teaching, are anxious to develop the ease and finish which others have acquired.

A scientific age demands results. This cannot be determined unless some measuring device is set up. The very nature of evening classes, with short courses, a variety of students and other unusual factors, makes it very difficult to measure results. However, we may proceed on the theory that the dissatisfied student will drop out. If the class attendance holds up better after the teachers have had the benefit of in-service training, we may safely assume that upgrading had a beneficial effect. An increased enthusiasm among teachers can very readily be noted. The administrative officers can quickly note the difference in the quality of teaching. This will appear in better organization of material, greater

alertness on the part of teacher and students and better student grades on test sheets. Adult students are not slow to make comments to the administrative staff about the quality of teaching.

The Future

We are not too keen yet about putting the evening school on a basis of pupil-hour-cost. And we find something in the evening classes besides the I.Q. These measuring devices help us to understand the problem, but the emphasis should be placed on other things. People who come to evening school represent a healthy cross section of community life. They are a part of the pulsating fabric of the city and will contribute their share to the upbuilding of the prosperity of the town. It is essential that they have a chance to look forward hopefully to the future and to feel that they will have an increasing importance in the economy of their time. This means a better job, greater acceptance by their fellow men, greater happiness. The evening schools are producing results, gaining greater support and building a better society.

A Curricular View of Industrial Education

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Changes in social and economic conditions have affected education in many ways, especially so in the field of industrial education. Many views are held on the various phases of industrial education which have appeared on the educational scene in the past fifty years. Each type was developed to fulfill a need for a new type of industrial training in the secondary schools. The aims of each can be compared with a philosophy which is emerging with regard to education in general. Some attempt must be made to integrate some of these forms of industrial education with the secondary curriculum to form a truly general education as a real preparation for life in this technological age. The selection of a type depends on how well it might meet the needs of the community and its educational system.

Education Is Affected by the Times

The period in world history through which we are now passing presents many challenges to everyone who has anything to do with education in public or private schools. The way in which these challenges are met and the degree of success in the answering of them will greatly affect the destiny of our future society.

Everyone is being affected by the fundamental changes in aims, values, and social trends of our times. Education must emerge as a vital force to prepare future generations to live in the new social-economic order of things.

Our new knowledge derived from research in the sciences has changed our concepts about learning and the learner, and has given us an appreciation of what mental growth and development requires.

There is a need for a clear comprehensive outlook of the underlying purposes and the meanings of what is being done and what should be done in education. There are certain fundamental goals toward which all education must work.

Gradually coming into actual practice is a philosophy of education that promises to offer a common ground on which secondary education may be reconstructed. Although its application will vary from the small school to the large school, from rural community to urban community, from the school of the rich and the school of the poor, one aspect of the current curriculum movement shows a general agreement in the statement of a philosophy.

The common emerging point of view begins and ends with the treatment of the pupil:

1. It sees education as living, which implies growing.
2. It sees growth as coming through experiencing and doing.
3. It points out that education presupposes interest and that interest grows through activity.
4. It set up the pupil before the subject.
5. It avoids the formal content administered in the traditional question-answer procedure.
6. It brings the pupil into the planning of his program and the evaluation of his progress.

Secondary Education Needs Attention

The adjustment of education to shifting society has been generally ignored by most makers of courses of study which follow the usual pattern of the subject curriculum. It is becoming gradually more apparent that revision of the curriculum of the secondary schools needs to be given some attention by educators to meet the common needs of the students and the needs of our present era.

Curriculum revision is not something which reaches a definite end and then stops. Revision must be continuous, being fed and supplemented to meet current needs. It means revision of the way in which the curriculum is looked at and the revision of the means for carrying it into practice, centered around pupil development. Writing a course of study becomes a small part of the curriculum program. It might well be half devoted to an introduction which develops a proper attitude toward the curriculum, and the other half concerns itself with carrying the program into practice.

There is a growing belief that a better education for high school boys and girls can be given if subject matter is used as a means instead of an end. With this in view the program organization is concerned with the development of a core curriculum which will form a most important part of the whole program of the secondary school, and to which electives and specialized courses may be added to answer many requirements.

The core curriculum is that which is required of all pupils but being concerned with the solution of problems rather than

formal subject matter it cuts across all subject and departmental boundaries. Its provisions and the problems which it tries to solve are as follows:

1. The core curriculum offers opportunity to provide meaningful experiences for all pupils through the study of significant life problems, to the end that greater learning will result.

2. The opportunity is provided to teach logical and critical thinking. This calls for facts, subject matter, and knowledge, and in dealing with problems of life which have meaning and importance for the pupil here and now.

3. The business of the school is to also identify common elements in the experience of all, and to prepare materials and procedures which will insure that all youth have an opportunity to share in these experiences.

In every respect equally as important as the core part of the curriculum, is its elective portion. In the light of their own aims and with the aid of careful guidance pupils should elect subjects suitable to their abilities and interests.

Industrial Arts in General Education

Industrial arts has an increasingly important role to play in the program of general education. It is defined by Bonser and Mossman in the following words: "As a subject for educative purposes, industrial arts is a study of the changes made by man in the forms of materials to increase their values, and of the problems of life related to these changes."

The coming of the junior high school as an exploratory school, exploratory of academic subject matter, of the pupils self and of occupations, provided a nearly ready-made, logical, and significant field for the industrial arts in general education. The subject matter of the industrial arts being such that it could be readily adapted to individual differences enhances the position of this group of subjects in general education as a whole and in the junior high school in particular. As a much needed vocational first step, that of self and occupation finding, it has an unusually fine opportunity for serving all students as an exploratory aim, which may result in either positive or negative decisions in any particular case, so far as industrial education and careers are concerned.

In summarizing the aims of the industrial arts in the junior high school they may be classified first as the manipulative:

1. To provide self-exploration in and information about industrial and related occupations for the purposes of guidance in education and vocations.

2. To provide some skills with, and information about the tools, materials, drawings, etc., which are commonly used in and about the home.

3. To provide early opportunities for boys and girls to make and do things which they desire to do with tools and materials.

4. To provide the chance for creative experiences in arts and crafts for avocational purposes.

5. To remove the fear element in the use of mechanical devices found in modern industrialized society.

Aims other than manipulative are as follows:

1. To develop consumers knowledge and appreciation of the materials, products, tools, workmanship, and design in modern industry.

2. To help develop good work habits and good attitudes toward work and workers.

3. To help develop elementary understandings of social-economic regulatory factors in our current industrial civilization.

4. To provide opportunities for significant experiences in creative thinking and doing through individual and group projects.

5. To provide those valuable developmental experiences associated with learning through doing, through the sense of touch or feeling in combination with other senses, which is lacking in so much of modern education.

Some years ago John Dewey wrote: "An occupation is the only thing which balances the distinctive capacity of an individual with his social service. To find out what one is fitted to do and to secure the opportunity to do it is the key to happiness."

The core curriculum is especially important in the ninth year of high school at the time when the adolescent begins to have definite ideas as to his place in the world, and is being swayed by various influences. With a broad view of a wide range of knowledge coupled with guidance which analyzes his abilities he can be helped tremendously in deciding the general direction of his further progress.

As he moves on through the high school the youth gains strength and confidence to make his choice of the elective portion of the curriculum. He gradually moves from the core curriculum into the area of his interests, needs, and abilities which should be found in the elective portion of the subject offerings.

Among the subjects which should be provided as electives in the senior high school are the industrial-arts courses which cover areas of industrial uses of wood, metal, electricity, etc. As an elective, the objectives emphasized as being of major importance are:

1. The vocational objective: The emphasis here being on the versatility which the youth develops in skills and use of knowledge gained to enter a field of employment where he may be required to adapt himself to changing conditions. By virtue of his training in industrial arts he can adjust himself within the general occupational area.

2. The technical objective: It is believed that industrial arts is a good background for the student who intends to go on to engineering college or to terminal courses in the junior college, or even to specialized trade training in high school or post high school years.

3. The methods objectives: In this may be found a number of other objectives but the emphasis is on the "know-how" as applied to production, rather than in the development of skills. The over-all picture in an area of industry would be presented in such a way as to show how it all tied in under the managerial aspect.

Vocational Industrial Education Is Specialized

There are those pupils who at an early age must decide on a definite pattern for their lives. Usually through economic necessity or a very strong interest they desire to enter a definite occupation.

The vocational-industrial courses offered in many high schools aim to impart specific trade skills, trade knowledge, related theory, and trade appreciations. This is terminal education. The student can upon graduation enter into his chosen occupation with confidence that he knows much about it.

In many communities trade training has been a part of the school system for many years and industries and labor have given it recognition and encouragement for the most part.

There is the idea in some quarters that industrial practices are changing so rapidly that it is advisable to give thorough trade training in the public schools. Changes in the world of work, however, do not come about any faster than upgrading can be given for them. The core content of the skilled trades has not changed more rapidly than men could adapt themselves to them. The men and women who are unemployed are not, as a rule, those who have had broad foundation training for their careers. The statement that industrial education should be left to industry rather than the schools co-operating with industry gets little backing either by representatives of labor or of employing groups. The whole trend in industrial education, for several

decades at least, has been toward delegating a larger share of vocational education to the lengthened pre-employment period when individuals are still under the control of the schools. The great mobility of labor, greater labor turnover, and the fact that industry is geared more and more for high speed production and increasingly less for vocational instruction are some of the pivotal facts that govern the situation.

Vocational-Technical Education Emphasizes Technologies

Technical high schools provide technical courses which train for junior engineering occupations. Schools giving this type of education have attracted considerable attention because of the success which they have had in fitting boys to serve as technicians, servicemen, junior assistants to engineers, architects and production supervisors. The positions for which technical courses train are subprofessional but not those commonly thought of as skilled-trade type, such as is the case of the industrial courses.

In the technical high school, shopwork, though essential, is organized to supplement, illustrate, and clarify, the instruction of the technical subjects. The shop teacher serves the technical teacher. The pupil works on as large a variety of projects in the shop as possible, but the degree of skill required is not so great as in the vocational-industrial high school.

The technological developments in industry are increasing the need for technically trained personnel in the opinion of many industrial representatives. In view of the rapidity with which technological changes transpire, the aim of the technical high school is to give as broad an education as possible in mathematics, science, and technology in the given field of industry. This breadth is not to be given at the expense of thoroughness in fundamentals. Rather the aim is to have the fundamentals of science, mathematics, drawing, shopwork, and technical information thoroughly mastered by having a closely integrated program in which each of these parts of the curriculum forms an integrated part of the whole. This is in contrast to the manual training type of course in which no vital relations bind the various science, drawing, and shop subjects together.

In order that the pupil may not be developed only along technical lines, but be better fitted to take his place in modern society, he receives instruction in the ninth grade in social studies, American History, and regular high school English. The technical high school aims to provide not only a suitable vocational education and training for technical occupations, but also a good liberal secondary education.

General Vocational-Industrial Type Needed

Each of the three types of industrial education briefly touched upon here, industrial arts, vocational-industrial, and vocational technical, have many definite advantages which must be recognized and to the administrator who seeks to provide the best program for his situation there is much to be said for each. Each type has made its mark on the educational scene and each is expanding in its field of application.

However good these programs may be there seems still to be a problem in the secondary school sometimes of finding just the right program. A type of general vocational education is demanding some attention.

There is nothing sacred about the idea that vocational training is truly vocational only when it trains for but one pay-roll job. To show that this traditional idea is crumbling, we need only refer to the automotive service-repair curriculum. In the Smith-Hughes Law a half step was made in this direction through the provision for "general industrial courses in cities under 25,000." A need was recognized, but the type of program authorized did not meet the needs, as evidenced by the almost negligible number of such programs. Those in existence are almost wholly on a complete skilled-trade basis.

"There are thousands of communities in the United States where good industrial training on a post industrial-arts level is needed. This should provide advantageous entrance into any of several related electrical jobs, woodworking jobs, or metal-working jobs, or other similar type groupings. Initial employment opportunities would be vastly increased. Preparations for any one of the group of related jobs would not be as extensive as is the case in the training for a unit trade. This has been referred to as training for a *job family* or *constellation of occupations.*

"Such a program would not be industrial arts as we generally think of it. Neither would it come exactly under the provisions of federal reimbursement for vocational education. Yet a program of this kind is sorely needed, and it could be provided in many communities that cannot justify a unit-trade program." (Friese, J., *Course Making in Industrial Education,* 1946 [Peoria, Ill.: Manual Arts Press]).

Conclusions

The most startling educational development of the 1930's was the sudden and rapid acceptance by general educators of the age-old fact that purposeful work is in itself education. It is general education for everyone. Those whose education lacks this vital experience are always one-sided and theoretical or impractical in many things. To incorporate much of this purposeful work in the secondary curriculum is an outstanding challenge of the immediate future.

A comprehensive system of industrial education and training should include the following elements: elementary school education, including a few hours weekly of industrial-arts work; four years of in-school vocational education, starting with an exploratory ninth year offering work of a prevocational nature, and providing in the next three years an increasingly specific education and training in trade school, vocational-technical high school, or technical high school. Graduates of these schools should then be enabled to make an easy and systematic transfer to apprenticeship or less formal type of in-employment training.

It is true that vocational education implies a certain degree of specialization, which is essential to the realization of its goal of practical occupational preparation. But a sound vocational education program does not prevent a student from getting a sound, balanced general education. The danger of vocationalism exists only when the principles and aims of a fully rounded education are neglected.

The high schools cannot nullify their significant achievement in having incorporated vocational education and training in their sphere. The need is too great to permit their withdrawal from the field. Liberal-arts educators should therefore accord to vocational education its rightful place in the unified educational program, in order to avoid a definite cleavage among the secondary schools.

Vocational education does not compete with the goals of a truly humanistic education; on the contrary, it embodies some of the latter's oldest and soundest principles — learning by doing, preparation for life, and the integration of education with the actual social process.

If you're as bright as your lights, you'll dim 'em! The National Safety Council says darkness adds danger to highway traffic, especially if drivers are blinded by each other. Keep your eyes and your lights on the road, and avoid glaring errors. — *Safety News.*

The 1948 all-accident death rate was 67.1 per hundred thousand population. This is the lowest rate on record. — *National Safety Council.*

Some Leaders in Industrial Education

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(*Continued from page 10 of the January, 1950, issue*)

The extension courses, carried on by members of the College faculty who make trips weekly to various centers throughout the state to instruct classes of teachers, and to visit and consult with the teachers on the job so far as possible — these courses have become one of the major services offered by the department for the upgrading of the industrial education program of Pennsylvania.

Co-operation With the State Department of Public Instruction

Under Dr. Struck's leadership the Department of Industrial Education at Pennsylvania State College established close co-operative relationships with the State Department of Public Instruction. He was admirably fitted for taking the initiative in co-operative endeavors because of his six years service in Harrisburg. One of the first fruits of this co-operation was the offering of leadership training courses in important industrial centers, open to persons other than teachers in the industrial schools. These included foremen, personnel workers, co-ordinators, and other supervisory officials in industrial plants, as well as superintendents and principals of schools who wished to inform themselves on the theory, aims, purposes, and problems of organization and administration of industrial schools and classes. Members of the faculty of the Department of Industrial Education, including Dr. Struck, visited the larger industrial plants in various sections of the state for the purpose of organizing conferences, leadership training classes, and foremanship training classes. The practical results of these efforts included greatly increased and more widespread interest in the program and the objectives of industrial education, but also, in time of need, intelligent support of requests for appropriations and improvements.

Typical of the service rendered by Dr. Struck and his co-workers during this period was the series of short-term special courses offered to members of municipal fire departments. In planning, organizing, and conducting these courses, in various centers throughout the state, Dr. Struck was influential in drawing upon the services of the leading experts in the fields of fire prevention, protection, fighting, and securing the co-operation of the public in taking the necessary precautions for the prevention of fires. "For his contribution in this field of endeavor, Dr. Struck came to hold a very high place in the esteem of officials and members of staffs of fire departments. One of the companies made him an honorary fire chief in recognition of his services."

Farm Shopwork

Dr. Struck will be remembered best and longest for his writings, for these seem likely to endure. His first book, *Construction and Repair work for the Farm*, was published in 1923 during his term of service in the Pennsylvania State Department of Public Instruction. It was designed as a textbook for high school courses in farm shopwork as well as for courses in the College of Agriculture. The book was the direct outgrowth of the author's teaching of the subject at Pennsylvania State College. Many of the projects described originated with students in his classes or instructors under his supervision. The projects cover a wide range of interests, and include pieces of equipment, apparatus, small structures, and enclosures, "applicable to vegetable gardening, field crops, horticulture, swine husbandry, cattle husbandry, sheep husbandry, dairy husbandry, poultry raising, and general farming. In addition, there are projects for the farm home, self-made equipment, instruction in sketching, mechanical drawing, and belt and harness making and repairing."

One section of the book deals with the selection, care, and use of the hand tools useful in the farm workshop in coping with the repair and adjustment problems of agricultural equipment, including tools and devices for woodworking, metalworking, pipe fitting, blacksmithing, leatherworking, painting, and soldering. The book is fully illustrated with drawings and photographs of tools and equipment, as well as of the projects to be made by the student. Working drawings, made by the author, are accompanied by bills of materials, and instructions for making, designed to aid the inexperienced worker in solving the construction problems.

The Part-Time School

Two years later, in 1925, the report of a study entitled *Part-Time Co-operative Industrial Education* was published as a bulletin by the Pennsylvania State Department of Public Instruction. Although this type of training for young employed workers had been developed extensively in various parts of the United States, notably in Wisconsin, Massachusetts, New York, and New Jersey, there were at that time only nine school districts in Pennsylvania in which such schools or classes had been organized.

From his study of these schools in other states, Dr. Struck had a vision of the need in Pennsylvania for the service which could be rendered to young employed workers in the mills, factories, retail stores, offices, and other places of employment. Talking with superintendents of schools, employers, personnel managers, and labor leaders, he discovered that preoccupation with other matters and lack of knowledge about the purposes and accomplishments of the part-time school were the principal reasons why so little had been done. He also discovered a willingness to listen to an explanation of the aims, purposes, plan of organization, and methods of procedure, and usually a willingness to give the plan a trial.

Realizing the difficulties involved in going in person, or sending representatives from the department, to even the important centers of the state, and the length of time that would be required for getting a comprehensive program under way, Dr. Struck set to work on the preparation of the manuscript of a bulletin, which he hoped might serve as a handbook, or manual, or guide for superintendents, boards of education, employers, and workers in planning the organization of such schools.

The bulletin included a discussion of the educational, social, and guidance needs of young persons who drop out of school early to go to work; also a statement of the educational philosophy underlying the part-time co-operative school, and its relation to other divisions of the public school system, to the requirements of the employer, and to the needs of the worker. The

bulletin included discussion of the practical details essential to the proper organization and efficient conduct of the part-time school, such as housing, equipment, methods of teaching, qualifications of teachers, and methods for securing the needed co-ordination between the part-time school and the place of employment, on the one hand, and the public school system on the other.

The bulletin was used very effectively in promoting statewide interest in the program, and in the effort to secure a measurable degree of uniformity in practices and procedures, as well as in standards of efficiency.

Methods in Industrial Education

One of the practical outcomes of Dr. Struck's determination to do something about the need for better professional preparation and higher standards of teaching in industrial education, referred to earlier in this sketch, was the publication of his first book in this field, *Methods and Teaching Problems in Industrial Education,* in 1929.

Dr. Struck recognized that in planning and organizing a vocational school the administrator meets problems and situations in which compromise is unavoidable. In the early stages of the movement, certainly, it was very difficult if not impossible to find men and women who possessed both competency in the vocation to be taught and demonstrated ability in teaching. If the appointing officer cannot secure both and must make a choice between the two, it is admitted that vocational competence comes first, and it is hoped that teaching ability may be acquired later. It is undoubtedly easier, as the author points out, for the high-grade mechanic or craftsman to acquire some understanding of and preparation for the work of teaching his craft, than it is for a teacher to acquire the necessary technical and mechanical skills, and especially the experience, of the high-grade craftsman. At the same time one of the difficulties is that the hope that adequate teaching ability may be acquired later is too frequently disappointed. The high-grade craftsman may begin by attending a short series of "conferences" with considerable enthusiasm, he may receive a few visits from a supervisor or "co-ordinator," but before we know it the pressure of a heavy schedule pushes into the background all thought of further professional preparation, and the concept of continuous professional growth and improvement never really comes into focus.

This book represents a sincere and successful effort to stem this tendency to follow the lines of least resistance. It endeavors to supply certain aspects of the principles of educational psychology, methods and materials of teaching, the recognizable steps in the teaching and learning relationship, and some of the things that every teacher needs to know about how the mind develops and how thinking takes place. The book also discusses a number of the specific teaching problems and situations characteristic of the industrial school, and shows how the principles and theories are applied to the solution of teaching problems.

Foundation of Industrial Education

Another conspicuous lack which Dr. Struck early recognized and sought to meet was the general state of ignorance concerning the origins of and the fundamental reasons for the principles, practices, methods, and types of organization in industrial education. For a number of years at Pennsylvania State College he conducted a course in the history and literature of industrial education, with the view to aiding prospective teachers to become familiar with "the underlying philosophy, the basic principles, the prevailing practices, the accepted terminology, and recognized standards in trade and industrial education," and particularly to aid in understanding the sources of these concepts, and the reasons for their evolution into what we now know them to be.

Out of the materials developed in the giving of this course came the manuscript of another important book, *Foundations of Industrial Education,* published in 1930.

This book is one of the very few sources in which the general reader may find a discussion of the report of the Douglas Commission of 1902, which played such a significant part in the early development of popular interest in the movement, of the origins of the old National Society for the Promotion of Industrial Education, of the background of federal and state legislation for vocational education, of the early industrial education surveys, of the beginnings of the guidance movement, and of other significant events which helped to give form and substance to the vocational education movement as we know it today.

Creative Teaching

Many of Dr. Struck's friends consider his greatest single contribution to the vocational education movement to be his *Creative Teaching,* published in 1938. This book is the outgrowth of the conviction that "practical arts, vocational education, and general education are not watertight compartments of learning that are or can be separated from one another. Democratically conceived education must come to grips with all important phases of life, and must spring from an integration of all these areas of learning." The author takes cognizance of the phenomenal developments that have taken place in industrial arts, vocational education, and guidance, and the public recognition they have received. He makes a strong plea for more creative work, which "calls for discriminating thinking, wide reading, thoughtful planning, and critical evaluation of results."

Pointing out that the great teachers of all time have emphasized *self* activity, he describes creative teaching as "a procedure in which the emphasis is upon present-day needs, and in which *actual habits* of work are established *by the learners.*" Teaching is held to be creative if it arouses a zeal for learning, if it stimulates selective thinking and purposeful action. "It would be wrong to assume that creative work refers only to that which is distinctly different from other work." Thus, it may be said that shopwork which gives a new touch or a new tone to something that is quite "standard" may be in fact creative. There is opportunity for "creativeness" in all forms of industrial education.

Vocational Education for a Changing World

The manuscript of Dr. Struck's last great book, *Vocational Education for a Changing World,* was completed a short time before his death in November, 1943. Later it was edited for publication and carried through the press by a close personal friend of many years' standing, Dr. John Calvin Wright, at the time Assistant Commissioner for Vocational Education, U. S. Office of Education, Washington, D. C.

This book is essentially a survey of the entire field of vocational education of less than college grade, including studies of the fundamental principles, methods, and procedures for preparing prospective workers in agriculture, business, homemaking, and the mechanical trades and industries. The relation of industrial arts to vocational education receives attention. There are also studies of the various types of vocational schools and classes; federal and state legislation relating to vocational education; the organization of administrative agencies for vocational education on federal, state, and local levels, together with the formulation of policies and plans by these agencies; the purposes, methods, and influence of various organizations of educators, employers, workers, and others; and finally a summary of current trends and the outlook for the future.

"The books written by Dr. Struck have been used for many years as textbooks in industrial education teacher training classes,

and the authority of the writer and the soundness of his views make them invaluable contributions to the literature of industrial education."

Lectures and Other Activities

Dr. Struck's influence in the fields of vocational education and industrial arts will continue a potent force down through the years. His books will have permanent value in directing the study of college and university students as they prepare for the work of teaching, supervision, and administration. They will continue to guide superintendents, principals of schools, and other administrators in the formulation of policies and the development of plans in these fields.

In addition to the textbooks which have been discussed here briefly, he was also a frequent contributor to the professional journals. It is impossible in a few words to give an adequate account of his achievements, through these means, in raising the standards of teaching. He constantly sought to promote professional ideals through his practical and constructive discussion of the problems, methods, and functions of the industrial teacher.

His work as a teacher, especially in the Graduate School, and as a lecturer, deserves more extended treatment than available space permits. During his term of service as head of the department at Pennsylvania State College, 1926–43, Dr. Struck was in frequent demand as a speaker before audiences of teachers, administrators, and other educators, also before a considerable variety of more general audiences of school patrons, employers, workers, and others. On every suitable occasion he sought to promote better understanding of the problems, aims, purposes, and philosophy of vocational education in all its phases, as well as of industrial arts.

He also spent several summers as visiting teacher or lecturer at other institutions, including Iowa State College, University of Delaware, Kansas State Teachers College, Pittsburg, Colorado State College, Clemson Agricultural College, University of Louisiana, and Harvard University.

For the American Vocational Association, Dr. Struck directed a comprehensive study of industrial education teacher training at the graduate level. The report of this study was published by the Association as a Research Bulletin, in December, 1941.

He participated in a number of educational and vocational education surveys, including those conducted in Philadelphia, Allentown, and Bloomsburg, Pa.

He served as consultant in the review of definitions in the field of vocational education for the *Dictionary of Education*, sponsored by Phi Delta Kappa, national professional graduate fraternity in education, published in 1945, of which Dr. Carter V. Good, of the University of Cincinnati, was chairman of the board of editors.

Professional Organizations

Dr. Struck was active in many professional organizations, in several of which he served as an officer, and as chairman or member of important committees. These included Kappa Phi Kappa, Phi Delta Kappa, Kappa Delta Pi, and Iota Lambda Sigma, national professional fraternities. In 1931, he served as president of Iota Lambda Sigma, national professional fraternity in industrial education, and in the same year was elected a member of the national advisory council of the fraternity.

He was a member of the National Education Association, Pennsylvania State Education Association, American Vocational Association, Pennsylvania State Vocational Association, Pennsylvania Schoolmen's Club, National Association of Industrial Teacher Trainers, American Association of University Professors. He also served on the Editorial Advisory Board of *School Shop Magazine*, published in Ann Arbor, Mich.

From 1938–43, he served as secretary-treasurer of the Pennsylvania State Vocational Association. In 1941, he was chairman of the Committee on Research of the National Association of Industrial Teachers Trainers, and a trustee of the same organization for two terms, 1938 and 1939. In 1939 he served as vice-president of the Pennsylvania Schoolmen's Club, and was for several years, ending in 1943, a member of the National Panel of Arbitrators of the American Arbitrators Association.

For many years Dr. Struck was faculty adviser of Alpha Chapter, Iota Lambda Sigma, at Pennsylvania State College. In recognition of his services in this capacity, Alpha Chapter presented him with a life membership in the American Vocational Association at a banquet of the Chapter in July, 1942.

Personal

"Dr. Struck's personal relations with students and co-workers were always on a cordial and friendly basis. Two words that belong in any description of him are, kindly and scholarly."

He was a man of medium build, about five feet, eleven inches tall, with a genial and approachable personality that quickly won confidence and respect. He had many outside interests and hobbies, among which were photography, the writing of poetry, carpentry and cabinetmaking, and drawing.

"His background of trade experience, teaching, supervision, and administration, and teacher training, plus his genial personality and capacity for hard work, enabled him to make a lasting contribution to the field he so generously served during his lifetime. As the result of his efforts the field of education has been enriched by the contributions of many individuals who, following his example, teach creatively."

References

In addition to other sources I have made particular use of the following references:

Benjamin C. Whitten, *Ferdinand Theodore Struck, A Biographical Study*. An unpublished report submitted in partial fulfillment of the requirements for the master's degree, Pennsylvania State College, June 1, 1948. Loaned through the courtesy of Mrs. Alice Clark Struck.

F. T. Struck, *Methods and Teaching Problems in Industrial Education* (New York: John Wiley and Sons, 1929).

F. T. Struck, *Foundations of Industrial Education* (New York: John Wiley and Sons, 1930).

F. T. Struck, *Creative Teaching — Industrial Arts and Vocational Education* (New York: John Wiley and Sons, 1938).

F. T. Struck, *Vocational Education for a Changing World* (New York: John Wiley and Sons, 1945).

The Stadium High School. Historical sketch, prepared by Howard M. Carr, Principal, Stadium High School, Tacoma, Wash.

Veterans Administration approved 1,531,402 G.I. loans from the beginning of the program in June, 1944, through 1948. Of the total, 1,380,285 were for homes; 48,911 for farms; and 102,206 for businesses.

Of the 2,263,654 veterans on Veterans Administration disability compensation and pension rolls on December 31, 1948, a total of 1,656,838 served in World War II; 457,206, World War I; 45,440, the Regular Establishment; 103,465, the Spanish-American War; 667, the Indian Wars, and 38, the Civil War.

By the end of 1948, a total of 53,983 World War II veterans had exhausted their entitlement for education and training under the G.I. Bill. At the same time, 75,669 disabled veterans who formerly were training under Public Law 16 were declared rehabilitated.

The accident death toll in the U. S. last year was 98,000 lives, a 2 per cent decrease from 1947. Home deaths again led the list of causes, the only classification to show an increase during the year. — *National Safety Council.*

Industrial Arts and Vocational Education

John J. Metz, Editor

THE GENERAL SHOP

Teachers of industrial arts are greatly indebted to Professor Arthur B. Mays for the fine historical article "Notes on the Historical Aspects of the General Shop" on page 139 in this issue.

This article represents much conscientious work in searching through the literature of our field to discover the origin of this type of shop. It is well that Professor Mays undertook to do this work now, because these historical searches become more and more difficult as time elapses.

Our readers are urged to read and file this article for future reference.

ALTRUISM AND THE SCHOOL SHOP

The many disturbing influences which afflict the nations of the world at present, have a decidedly deleterious effect on society at large as well as on the individual.

The warring nations vied with each other in spreading propaganda aimed at inciting hate. Even the real young imbibed some of this from their elders, and it seems as though it would take several generations until we are back again to a sane view of judging the people with whom we have to associate.

It is well, therefore, to take every opportunity to instill into our students a realization that every individual has obligations toward his fellow man. For this reason, teachers should take a lively interest in arousing student participation in the fund-raising efforts which the different national health organizations stage during the year. Getting the students to contribute to these attempts at raising money to help others is a fine means of gradually instilling in them the habit of looking altruistically at others, even if they do not belong to one's family, community, state, or nation.

The Red Cross Fund Campaign is still on, and everyone should try to make his donation to this very worthy cause on or before March 31.

Another movement which needs our assistance, and to which teachers ought to invite their students to contribute, is the National Hearing Week promoted by the American Hearing Society, 817 — 14 St. N. W., Washington, D. C.

This society reports that fifteen million Americans have suffered an appreciable loss of hearing. Three million children are included in this number. This is quite a large fraction of our total population, and proves that the problem of prevention, alleviation, and probable cure of hearing difficulties needs intensive educational efforts and much further study by medical experts. This requires united effort; hence, the National Hearing Week, May 7–13, 1950.

Probably your community has no local chapter and you may be instrumental in getting one started. It would mean much to your pupils because a typical chapter can give the hard of hearing: audiometer tests, lip-reading instructions, voice improvement, auditory training, hearing-aid consultation, training for parents of hard-of-hearing children, and instructions for preschool children with a hearing loss.

SOME FACTS ABOUT STEEL

Instructors of woodwork, sheet-metal work, and machine-shop practice are much interested in factual and historical information about the materials they and their students are handling in the school shop.

Much of this can be culled from books, magazines, catalogs, and trade journals. Shop teachers do well to keep their eyes open for some of this valuable material because it helps them and their students to get a valuable background for much of the practical work in which they engage.

The steel industry, for instance, has collected much interesting information about its field. The facts quoted here have been culled from "Steel Facts," a monthly published by the American Iron and Steel Institute.

The decade from 1940 to 1950 saw the enormous steel production of eight-hundred million tons. During that time also many advances were made in producing a wide variety of alloy steels.

During the same period the wide continuous sheet mill was developed, and the number of these mills rose from seven to twenty-seven. Before 1849, the standard for pig-iron price quotations was based on pig iron made with charcoal. After 1849 it was based on pig iron made with anthracite coal.

In 1899, that is only fifty years ago, large diameter pipe was first rolled in Pennsylvania.

A blast furnace was built in Virginia over three hundred years ago, but it was destroyed by the Indians before it could be put into operation. The first blast furnace that was successfully operated in America was erected at Saugus, Mass., a short while after the Virginia effort had failed. This later furnace operated for more than forty years.

A wire drawing mill was built by Nathaniel Miles at Norwich, Conn., in 1775, but the beginning of the wire industry's development is generally conceded to a wire mill owned by Washburn and Goddard, which was started at Worcester, Mass., in 1831.

John A. Roebling wove iron wire into rope at Saxonburg, Pa., in 1840. His wire cables, later on, made possible the erection of some of the earliest suspension bridges in this country.

Another interesting development was due to the hoop skirts worn by the ladies in the earlier years of our country. The demand for flat wire needed to make these dresses, gave birth to our country's cold-rolled strip industry in 1859.

Barbed wire for fencing was invented by an Illinois farmer, Joseph Glidden, in 1872.

Statistics show that more than 85 pounds of steel wire were produced for every person in the United States in 1948.

Many more of these interesting facts about steel could be listed, but steel and metal are not the only materials that are used in the school shop. The field, therefore, is very wide and invites the energetic teacher to journey to the nearest library and to museums to find items of interesting information that will delight both him and his students.

While some of this material can be embodied in the regular lesson sheets, it also will be found suitable to keep the bulletin board supplied with a continuous stream of attention-getting items that will be found helpful in carrying on the work of the school shop.

A Method in Grading Shop Projects in Metalwork

M. O. JOHNSEN
Assistant Professor of Industrial Arts
Kent State University
Kent, Ohio

Objective tests lend themselves well to testing shop subjects. True-false, completion, multiple-choice, matching, and identification type questions may be constructed readily for these tests.

However, when it comes to the grading of the student's work it is another story, for this grading seems to be done usually in a subjective manner. There are several reasons for this. In many of our courses the projects are turned in for grading as the students complete them. It is rather difficult to grade these the same way day in and day out unless there is some sort of rating scale to grade by. The difference between an *A* or *B* on a project may be the difference between one or two cups of coffee in the morning.

A second reason for assuming that this grading is done subjectively is because the wrong basis for grading is often used. Most teachers use projects as a means to an end. The finished project is the total of the operations the student is to master. Upon this basis, then, the project should not be graded as a whole, but on the work accomplished by each and every operation involved in the making of it.

Many teachers grade projects by arranging them in some order of merit from the best to the poorest. This is better than no system at all. The weakness in this method is that the value of a grade may fluctuate from semester to semester. What may be an *A* one semester may draw a *B* or a *C* at a later date. Then too, locker and storage space may add to the difficulty of grading by this method.

In any grading system, the grading should be impersonal. It should not involve a great deal of paper work, nor should it be cumbersome. It should give the instructor a picture of the student's abilities and weaknesses. The latter can be used as a sound argument against the *whole project* method of grading, because the instructor will want to know where the student stands

Kent State University
Industrial Arts Department

I.A. 166 — General Metalwork — M. O. Johnsen, Instructor

Grading Sheet

Buck, R. _____ Period _____ Date _____
Name

Projects Completed

1. Double hem cooky cutter _____
2. Wired edge cooky cutter _____
3. Tin cup _____

WELDING	Points 25				
	6	7	8	9	10
Butt welds (WOR)					
Butt welds (WR)					
Fillet welds					
Penetration					
Neatness					
Accuracy					
Total points					

SHEET METAL	Points 25				
	6	7	8	9	10
Single hem					
Double hem					
Lap seam					
Wiring					
Lock seam					
Riveting					
Soldering					
	1			2	3
Burring					
Turning					
Forming					
Neatness					
Accuracy					
Total points					

FOUNDRY & FORGING	Points 25				
	6	7	8	9	10
Molding					
Casting					
Forging					
Hardening					
Tempering					
Annealing					
Neatness					
Accuracy					
Total points					

BENCHWORK	Points 25				
	6	7	8	9	10
Riveting					
Planishing					
Filing					
Hack-saw work					
Drilling					
Bending					
Forming					
Forging					
Finish					
Neatness					
Accuracy					
Total points					

Grades in Tests

Test No. 1. Points ..... Rank in Class ..... Grade .....
2. Points ..... Rank in Class ..... Grade .....
3. Points ..... Rank in Class ..... Grade .....

Average test grade .....
Notebook .....
Grade in shopwork .....
Final Grade .....

on each phase of his work. He should be able, when he is through grading, to justify each and every grade. He should have some system of grading which enables him to grade as the student completes his work.

These were the problems which confronted the writer in grading his students in metalworking at Kent State University.

In our beginning general metalworking course the students are rotated through four phases of work: sheet metal, bench metal, oxyacetylene welding, and foundry forging. Projects are chosen because they involve certain operations which we believe our students should know before they go out to teach. Projects vary from quarter to quarter but they all involve the same basic operations.

On the grading sheet there are four divisions of work. Under each heading are listed the operations done. In sheet metal, for example, the student makes a single hem, a double hem, soldering, etc. When a project is graded, the various parts of it should be graded. The student is credited with the highest score.

From the grading sheet it is noted that *Buck* received a 7 in soldering on his first cooky cutter. The cooky cutter is given the number 1, since this is his first project and the 1 is then placed in the 7 column so that it will be possible later to check back to see what he did on each job.

On his second cutter Buck scored a *9*. The number *2* is, therefore, placed in the 9 column.

On his third project the student scored a *10;* hence, the *3* is placed in the *10* column. Buck is credited with a *10* in soldering because it is his highest grade. By using this grading system, a picture of the student's abilities and weaknesses in each phase of the work may be obtained. Combining the grades from tests with grades in shopwork and the notebook, gives the final grade in the course.

This method of grading has been used by the writer for about a year. It is fast. It does not involve a great deal of paper work. The student can see where he stands on each phase of his work. The grading sheet can be a permanent record of the student's work in any course. The writer believes that this system may be easily adapted to a great many other phases of shopwork, and that other teachers will find it as helpful as he did.

School-Made Film Aids for Vocational Education and Guidance Programs

HAROLD HAINFELD*
Roosevelt School
Union City, N. J.

The past few years show an increased interest and use of film aids in our school curriculum. A glance at the advertising pages of current educational journals list many films that are available to schools on a purchase or rental basis. Many of these film aids, however, are prepared for general use and not to meet the specific needs of a particular school. Have you considered some of the possibilities of making school made movies or film strips to meet the needs of your school?

Equipment Needed

School-made movies and film strips need not be made with expensive photographic equipment; home movie and amateur cameras will suffice. The motion picture camera is manufactured in different models, generally being of the spring driven type with different sized lens opening for various speeds of film and the amount of light that is available. Three widths of film are used in making movies: the 35 millimeter, 16-mm. and 8mm. The 35mm. is used commercially in large theaters and is not practical for school use, while the 16mm. and 8mm. are better suited for school made movies. Both are manufactured in black-and-white and colored type.

Taking movies indoors requires photo-flood lamps and a faster type of film. A minimum of two lamps are needed for close-up shots, while three or four will be needed if a larger area is to be photographed. A light meter will indicate the proper lens opening for the movie camera.

Colored film adds greatly to the beauty of a movie, but it is more expensive than the black-and-white type. Furthermore it is difficult to get good results outdoors on cloudy days or in deep shadows. Colored film is manufactured in two types, one for outdoors and the other for indoor movie making.

An appropriation of thirty dollars will provide 400 feet of 16mm. black-and-white film with eight commercially made titles. Colored film for the same length would cost approximately forty-two dollars. A sound track added to the 16mm. film would cost about one hundred dollars. It is possible to run the silent type of 16mm. moving picture film through most sound projectors with a word commentary by the instructor. Remember never run a film with a sound track through a silent type projector. The 8mm. film costs half as much as the 16mm.

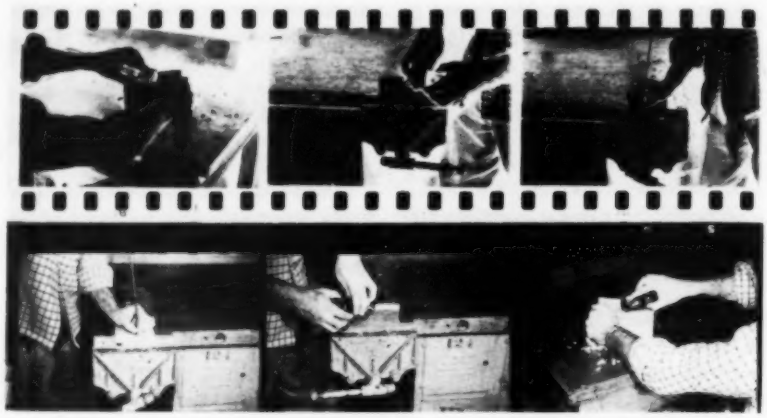
Equipment for producing and storing school-made film strips and slides. (Back, left to right – slide cabinet 2 by 2-in., 35mm. camera, Bantam camera (less expensive), camera for making 2¼ by 2¼-in. slides from size 120 film, light meter, slide projector with attachment for film strips. (Front) Film strips and containers, binding and wafers for readymounts

*Member of committee on school-made visual aids, N.E.A. Department of Secondary Teachers.

but at present it is impossible to have a sound track on the 8mm. film. Transcriptions at 33⅓ r.p.m. and wire recorders have been used with both 8 and 16mm. films.

While making moving pictures may be an interesting method of presenting information to students in their vocational training or guidance program, the making of film strips and 2 by 2-in. slides may serve the purpose just as well and be less expensive. Both film strips and 2 by 2-in. slides can be made with the present 35mm. still camera. Black-and-white strips can be made with two types of film, the regular photographic type or the *Direct Positive* which when developed will have the dark objects dark and the lighter objects will appear gray and white. This latter film is ready for immediate projection. By using the more familiar Plus-X or Super-XX film and a small box type printer it is possible to get similar results by printing from this negative onto 35mm. positive film. Personal experience shows the latter to be better as the faster Super-XX film offers many more possibilities than the slower *Direct Positive* type.

Many teachers interested in photography are familiar with colored readymounts. These 35mm. colored film slides are returned from the film laboratory bound in cardboard binders and ready for projection. It is advisable to bind these readymounts with glass wafers to protect them from scratching and finger marks. If the sender requests it these colored film slides need not be bound as readymounts, but left as a film strip. Cost of 35mm. colored readymounts is about 17 cents each and 20 cents as glass bound slides. A film strip of 36 black-and-white frames costs about two dollars.



School-made film strips on shop safety. (Top) Negative of film strip. (Bottom) Positive of film showing use of screwdriver, proper method of using a small plane, improper method

School Possibilities

How often have students gathered around one bench to observe the industrial-arts teacher demonstrate the use of a shop tool? Or, have the students been at their own bench, too far away to see and understand the function and safe operation of a tool. Wouldn't it be easier for a film showing this operation with all eyes concentrated on the screen with the instructor giving an explanation and ready to answer the students' questions? Shop safety rules, location of equipment, and a series of slides on projects made by former students with reference to where plans are located can easily be made to fit the needs of the particular shop by the industrial-arts teacher.

It is often difficult to take a class on a field trip to inspect and get information about various jobs; either the school administration will not permit students to leave the school for a long enough period, especially in the secondary school with students together for one period on vocational training and then scattered all over the building in many different classes the next period, or industries do not permit large group visits. It is often possible for one teacher equipped with a 35mm. camera and flash attachment to take a series of pictures to bring information back to the students in visual form. Personal experience has shown that many industries not permitting large group visits are interested and helpful in making of slides or film strips.

Orientation to the high school program can be helped greatly through a school-made movie or a series of 2 by 2-in. slides. It has been shown that students can learn more by seeing and listening rather than an orientation talk alone. School policy, outlines of various curricula, location of various classes, pictures of the principal, freshmen advisers, and teachers and general information about the school and first-year courses could be shown in an orientation film.

Films can be made by institutions of higher education for showing at high school *college and career nights* which are often spon-

Film strips may be made of safety posters and projected for class discussions

sored by the guidance department. Another film that can be made is on grooming and its importance in seeking and keeping a job. This can be made with the co-operation of the commercial and physical education departments. Posture at the typewriter and elsewhere can all be stressed in a film aid of this type.

Another possibility that film strips and 2 by 2-in. slides offer to the guidance and vocational counselor is the preserving of records. During the time the student is in school, many administrators place great emphasis on the cumulative record card in order that teachers, counselors and administrators may have definite information on hand regarding the individual. What happens to these record cards after the pupil has been graduated? Do they collect dust for a few years and then are discarded after 12 years of thought and effort have been put into them by teachers and guidance counselors? It is possible with the 35mm. camera mounted on a tripod to photograph these records and preserve them as a film strip ready for projection when the occasion arises. As film strips these records can be enlarged in much the same way that V-Mail was used during the war to preserve space of servicemen's mail. These film strips can be easily stored in cans occupying approximately one fifteenth the space of the actual cumulative record cards. A complete class record can be photographed on two or three rolls of film. It will not be necessary to reprint on positive film as the white cumulative record card will be black as a negative and the writing white, much easier to see when projected on the screen.

The use of photography especially of local applications to vocational information and orientation to the secondary school will enhance the group guidance program. Films of the shop with safety rules and various job projects will add interest to the industrial-arts program as well as provide the school with valuable additions to their visual aids library.

Problems and Projects

ASSIGNMENT SHEET FOR DRAFTING

J. H. McCLOSKEY
Lakewood, Ohio

Revolved Sections

I. *Work to be done in class:*

1. Study the part on revolved sections in your textbook and in the reference books to which you may have access.

2. Copy some of the figures presented in the books you studied.

A. Notice that the revolved section should be made as if it were a right-side elevation or a top view taken at that particular place. To help in determining how the view should be revolved, imagine the object placed in the projection box.

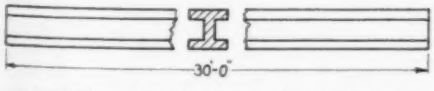
B. The revolved section differs from a side view or a top view in the three following ways:

a) The revolved section is crosshatched.

b) It is not placed above or at the side but right where the section is taken.

c) Only the cut portion is shown. No full or dotted lines are used to show what is beyond the section.

3. Notice that where the object is too long to be represented in its full length, it may be broken, and in such cases the revolved section is frequently given as shown below.



4. Notice that the removed sections are made for the same purpose as revolved sections but are shifted to some other place on the paper.

5. On a regulation drafting sheet, sketch one view and one or more revolved sections of the object so represented on the board. In a like manner represent other objects assigned by the instructor, such as the triangular scale, a piece of chalk tray, a triangle with finger lifts, one blade of a large pair of scissors, etc.

The homework as assigned under II should be started as soon as you have finished the drawing of the Picture Frame — Problem 51 in Bailey.

II. *Work to be done outside of regular class time:*

1. Make one view of each of ten different appropriate objects. On the view place one or more revolved sections showing the shape of the object at the specific place where the section is shown. In no case should this be done where a conventional break would answer the purpose. Review conventional breaks in your textbook.

a) Objects should be such as require a revolved section to represent them.

b) Drawings should be made freehand.

c) Drawings should not be made in the drawing room during the regular drawing period.

d) Drawings should be made on a sheet of the regular drawing paper with not more than five on a page. Use both sides of the paper and more than one sheet if necessary.

e) Drawings should be large enough so as to be clear in every detail.

f) Drawings should be carefully and neatly made.

g) Drawings should not be dimensioned.

h) The name of the object should be lettered neatly below the drawing.

i) Removed sections are not to be used.

j) Drawings should be handed in on time if full credit is to be given for the work done.

k) No object should be made of more than one kind or piece of material.

Start the third part of the assignment as soon as the instructor has given his demonstration at the board and required you to draw under his supervision a lead pencil, a putty knife, a screw driver, a cutter for the paper trimmer, etc.

III. *Work to be done outside of regular class time:*

1. Follow direction 1 under 2 above.

2. Observe *a* through *j* under 1 of II above.

3. All objects must be made of more than one kind of material, or more than one piece of the same material.

a) Note that different pieces of material that are in contact with each other in the section must be cross hatched in different directions.

LUCITE PROJECTION BOX

PETER G. POLOWNIAK
Mechanical Drawing Instructor
Thomas Jefferson Junior High School
Passaic, N. J.

The lucite projection box, shown in Figure 1, is made of six pieces of ½ by 6 by 6-in. lucite. These pieces are cut as shown in Figure 2. Number 20 common nails 1⅜ in. long are used as pins to hold the pieces together. Certain edges of each piece of lucite are rounded to permit a free swing when the box is opened. A small piece of ¾ by 1½ by 1½-in. lucite cemented in the center of the bottom is used as a stand on which to place the models. For small geometric figures such as triangles, circles, etc., a ⅛-in. slot is cut in the top of the stand. This enables a boy to stand the figure up and have it at right angles to the surfaces of the lucite box. A black wax crayon, such as used for marking china and glassware, is used in tracing the

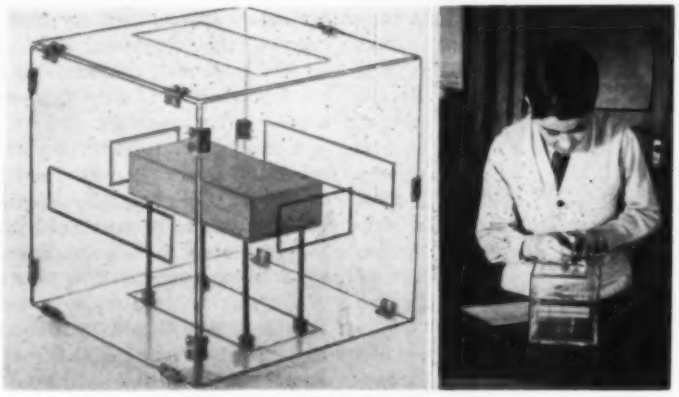


Fig. 1. Lucite projection box

views on the respective sides of the projection box. All crayon marks can easily be removed with a dry piece of cloth.

In using the projection box during a class demonstration all possible views are projected and traced on each piece of lucite. The box may then be opened out flat, as in Figure 3. The relationship of views is shown and discussed. The unnecessary views are removed by taking out the loose pins. Only the three necessary views remain.

For shape description, relationship, and alignment of views, this projection box has proved itself to be a very useful teaching device with the beginning classes in mechanical drawing.

Orthographic Projection — Shape Description

I. *Purpose — To Learn:*

1. How to describe the shape of an object by means of "views."
2. How to choose the necessary views.
3. Where to place these views in order for them to have meaning.
4. What is meant by *shape description?*

II. *General Information*

Every object whether it be a toy, a piece of furniture, a machine, or a building, first saw the light of day on paper. It was first an idea in someone's mind. Then it was developed as a plan on paper.

An inventor, a designer, or a builder in addition to having a clear picture of what the object looks like in his mind must also be able to describe it so that others may see it. A few lines drawn on paper will describe an object much more correctly and clearly than

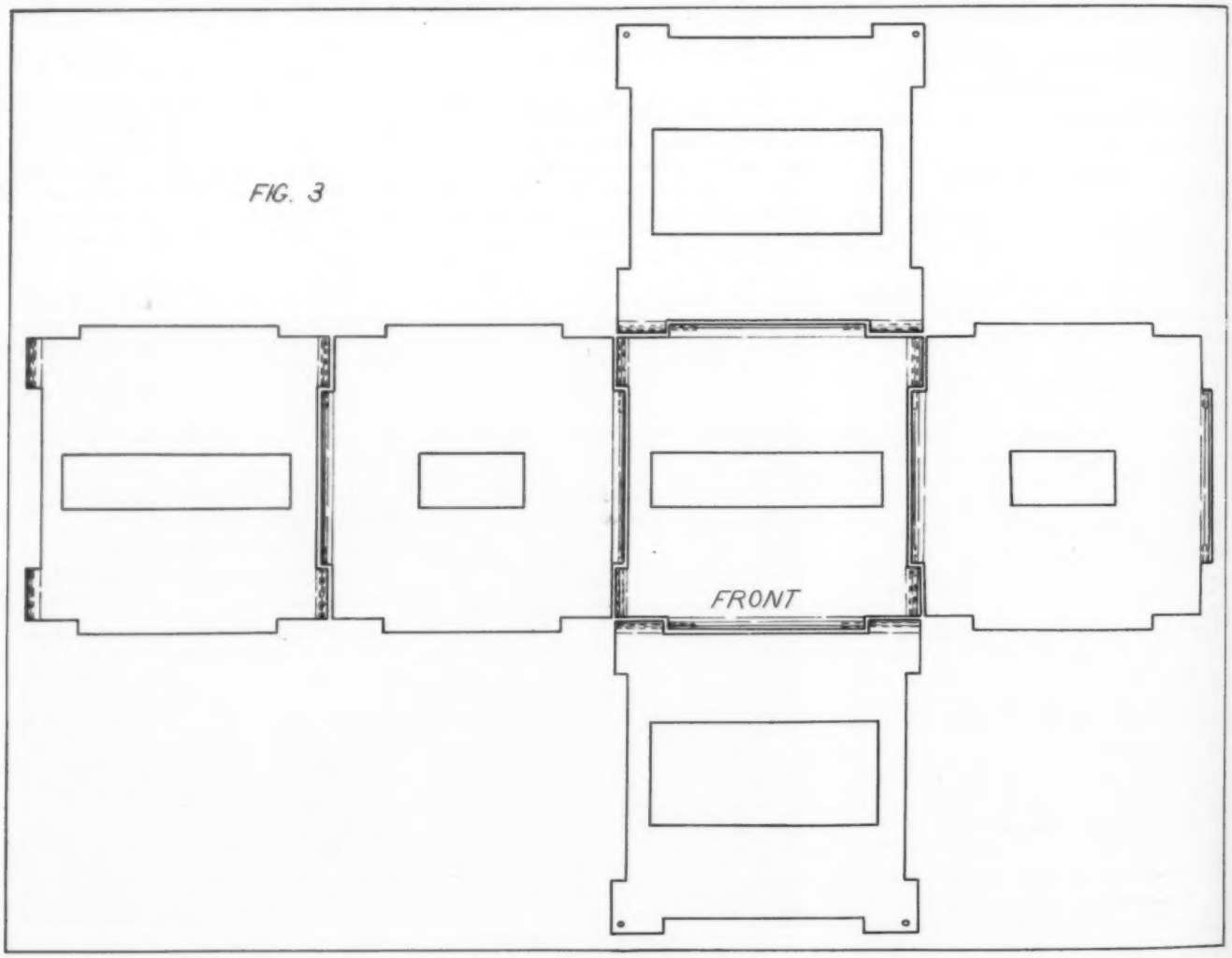
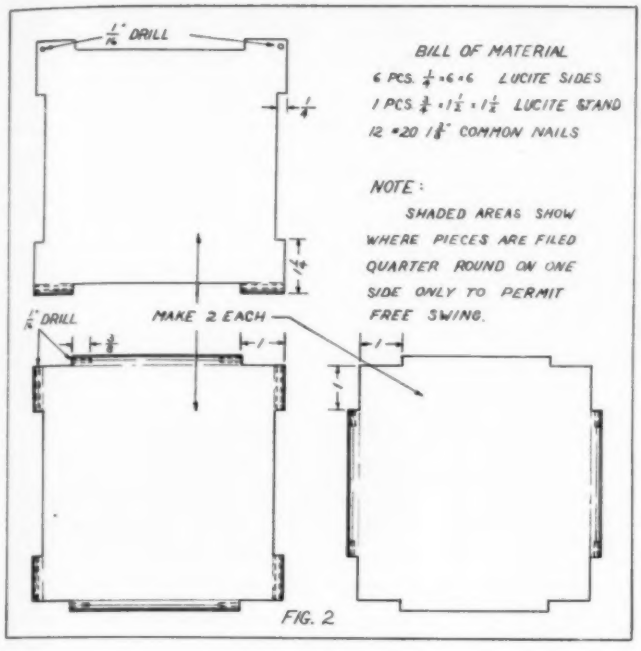
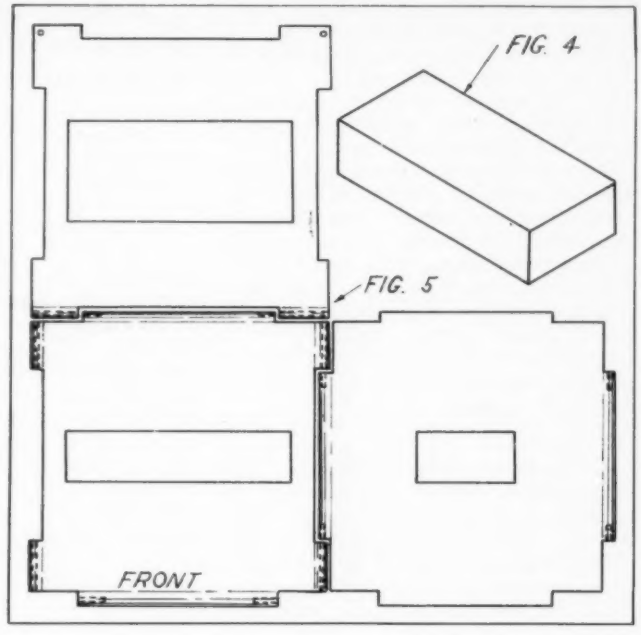


Fig. 3. Lucite projection box


BILL OF MATERIAL
6 PCS. 1/4 × 6 × 6 LUCITE SIDES
1 PCS. 3/4 × 1 1/2 × 1 1/2 LUCITE STAND
12 #20 1 1/4" COMMON NAILS
NOTE:
SHADED AREAS SHOW WHERE PIECES ARE FILED QUARTER ROUND ON ONE SIDE ONLY TO PERMIT FREE SWING.
1/16" DRILL
MAKE 2 EACH
FIG. 2



a picture, a written description or an oral explanation. It is true that pictures, paintings, and photographs can be made which would show the general appearance of an object. But these would only show the object as it appears and not as it really is.

The drawings that inventors, designers, builders, draftsmen, and engineers make are called plans, working drawings, or mechanical drawings. They are called thus: (1) because instruments are used to draw them, (2) because they are drawings which builders, workmen, mechanics, etc., work from. Because mechanics in the different parts of the country may use the same drawings, it is necessary that these drawings be drawn according to a system that both the person who makes the drawing and the person who is to work from the drawing can understand. Therefore, these drawings are made according to a system called orthographic projection. The name comes from the Greek words, *orthos* which means straight, and *graphos* which means to draw or to write. You will agree that even though it is a difficult word to acquaint yourself with, it is still a good choice for drawings that are drawn with instruments.

Let us examine this system and see what it is. Suppose that we want to make a mechanical drawing of a rectangular object, such as an oilstone, according to the orthographic projection system. An oilstone, as most of the students know, is a rectangular piece of natural or artificial abrasive material which is used for putting a keen edge on a cutting tool. The shapes of oilstones vary. Perhaps you've seen the round oilstones that the boy scout uses in keeping his ax sharp. The one used in our school shops is rectangular in shape, such as is pictured in Figure 4. We can best understand the system of orthographic projection if we first place the oilstone in the middle of a six sided box, with transparent sides. The one shown in Figure 1 is made of lucite. This material is not as fragile as glass. A box of this kind is usually called a projection box. The sides are hinged to one another by means of small nails. Lift the top and place the oilstone on the little stand in the middle of the projection box as shown in Figure 1.

According to this system let us see what the shape of the oilstone would be. Look through the top of the projection box, down at the top of the oilstone. With a special black pencil crayon trace the outline on the lucite top, exactly as you see it. Looking at this outline we can say that the shape of the oilstone, when viewed from the top, appears to be a rectangle.

Let us then look through the front of the box at the front of the oilstone and trace the outline on the lucite as seen from this point. This is what is known as projecting the views. In like manner project all the sides of the oilstone onto the corresponding sides of the box. Our projection box now looks as in Figure 1. Next open the top, remove the oilstone, and flatten out the box as shown in Figure 3. This is done by removing the loose nails from the hinges. We now have six squares of lucite with an outline of a rectangle on each piece. Each rectangular outline represents a side of the oilstone. The rectangle that describes the shape of the top of the oilstone is called the top view; the one which describes the shape of the front is called the front view; the one that describes the shape of the right side is called the right side view, and so on.

Upon examination you will notice that, of the six rectangular outlines, there are only three different size rectangles. The reason is that the top looks the same as the bottom, the front the same as the back, and the right side the same as the left side. In a mechanical drawing, it will be necessary to show only those views which adequately describe the shape of the object. For many objects, the top view, the front view, and the right side view, also called the end view, is all that is required, and we can therefore, eliminate the bottom, back and left side pieces of the projection box. This leaves us, then, the three sides shown in Figure 5. As you may notice, the top view is directly in line with, and directly above the front view. The right side view is directly in line and to the right of the front view. This position of the views is very important to know since the views are never labeled. The next time you look at a mechanical drawing, made according to the orthographic system, you will immediately be able to recognize and identify the different views from their position in relation to one another. You can also understand why the views are separated. If they were joined together, the drawing could easily be mistaken for one view of an object rather than three separate views. The position of views in a drawing is as important as the position of letters in a word. In a proper order they make sense. An improper order leads to confusion and misunderstanding.

We have just described the shape of the oilstone by means of three views. You might ask, are three views always necessary in order to describe adequately the shape of an object? Let us see. The purpose of views is to give a complete shape description of an object. How many views are necessary to describe the shape of a ball? Any way you look at the ball, it looks round. And so, a circle drawn on a piece of paper with the title *ball* or *sphere* would certainly describe its shape. There are a few objects whose shape could be described

with one view. You will find that most mechanical drawings consist of two or three views. More complicated objects are described in more than three views.

Each view drawn should have a part in describing the shape, otherwise it is not needed and therefore not drawn.

You will be given 18 small objects: cube, square, rectangle, ball, isosceles triangle, right triangle, circle, semicircle, cylinder, half cylinder, inside half cylinder, rod, cone, wedge, pyramid, pencil, eraser, and an arch firebrick. You will be asked to sketch as many views of each object as you think are necessary in order to give a complete description of the shape of each object. You may use the projection box with any or all the objects you are not certain of.

III. *Procedure*

The sketching of the 18 different shaped objects will be done on four sheets of 8½ by 11 in., ⅛-in. squared graph paper. These views are drawn with a 4H pencil. Use either of the triangles as a guide in drawing straight lines. A compass is used for circles and parts of circles. The titles are made with an H pencil. Each view is drawn the full size of the object. The first sheet contains views of the following six objects: cube, square, rectangle, ball, and two different kinds of triangles. Divide each sheet of paper into six rectangular spaces as follows:

Each sheet is eight 1 in. squares wide, and ten and one half 1 in. squares long.

1. Fasten the paper to the drawing board with the length from left to right.
2. Count four 1-in. squares down from the top edge of the paper.
3. Using the straight edge of either triangle as a guide, draw a horizontal line through this point.
4. From the left edge of the paper count three 1-in. squares to the right, set the straight edge of the triangle at this point and draw a vertical line from the top to the bottom of the paper.
5. From this line, count three 1-in. squares to the right and draw another vertical line. The sheet is then divided into six rectangular spaces.
6. Draw the cube in the upper left corner box, the square in the upper middle box, the rectangle in the upper right corner box, the ball in the lower left, the smaller triangle in the lower middle and the larger triangle in the lower right corner box. Complete all views, print titles, label views, and have instructor check your sheet before proceeding to the second sheet. The second sheet is divided in the same manner as the first one. Check with bulletin board to see how the third sheet is divided. The fourth sheet is used for the views of one large object. Be sure that you understand how to pick out the views which best describe the shape of the object and where to place the views in relation to each other. Views mean nothing at all, unless they are placed in the proper relation or position to each other. It is very important that you understand this clearly. Check with the instructor whenever in doubt.

MAILING TUBE BED LAMP

SIMON S. PALESTRANT

New York City

Here is a bed lamp that is efficient, simple to construct, and rather inexpensive. It is made of a mailing tube.

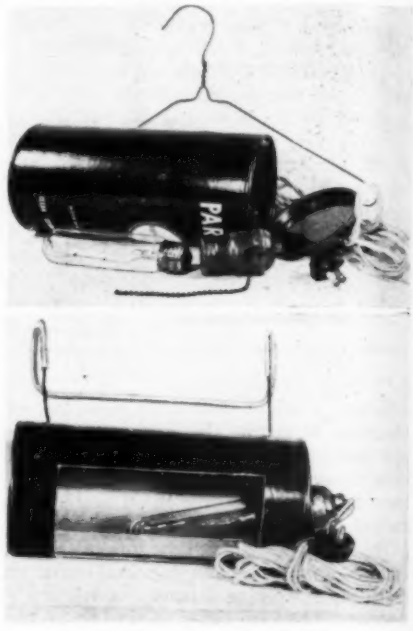
Procedure: A 16-in. length of a 4-in. mailing tube (any linoleum shop will have some about) and two metal covers to fit the ends. An accurate fitting is important. Cut out a 12 by 3-in. slot along the side of the tube, allowing equal margins on both ends. This is to permit the light to flood the head area of the bedstead.

To make the fittings for the window opening, cut a flat curtain rod in half down its length. With a pair of snips, cut off each section a piece 14 in. long. Set a part of this cut section of the inside, above and below the length of the opening and parallel to it. Make certain that the concaved area faces the opening from each side and the most recess part of the concave is an inch and a half from it. This will give you a double track on either side of the window and 6 in. apart. Attach these tracks to the tube by punching or drilling a hole on each end of the tracks and corresponding holes through the cylinder, then fastening them together with small brass paper fasteners or split rivets.

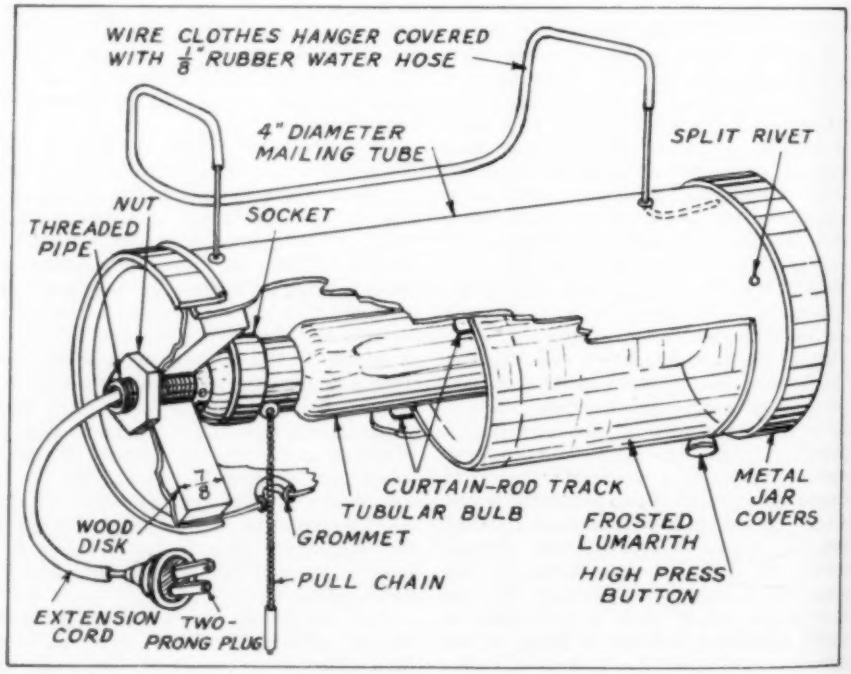
A nonglare window is made of frosted lumarith cut into two sections each measuring 9 by 6 in. Slip these into the track and fasten a high metal dress button with a wire to the extreme ends of the lumarith slide window. These will act as knobs to permit the sliding of said windows and keep them in a position where they will not interfere with the illumination.

Now cut two disks that would fit snugly into the ends of the tube as wood stoppers. Use ¾ or ⅞-in. stock. Drill a ½-in. hole in one to allow a nipple tubing to pass through snugly. Fit these wooden stoppers into each end of the tube (the one with the hole is reserved for the extension cord). Glue applied to the ends of the block and then tacked down through the cardboard with No. 20 ½-in. nails will fasten them securely.

Drill a ½-in. hole in one of the jar covers and fit the respective lids tightly in place. Set



Mailing tube bed lamp



Mailing tube bed lamp

a short piece of continuously threaded electrical pipe (1½ in. long) anchored into place with a nut on the inside and the electrical socket (set screwed) on the inside. Cut a ¼-in. hole in the position where the pull chain of the socket extends so that it can hang out of the lamp to be within easy reach. Put a gromet into that hole to keep the chain from filing the hole out of shape.

The device used to hang the lamp over the top of the headboard is made of a wire clothes hanger. Open a hanger to its full length. Bend it into shape as illustrated in the sketch. Make sure that it is wide enough to grip the bed without scratching it. Gromets set through the mailing tubing will save a lot of wear and tear.

Give the inside a coat or two of aluminum paint so that it acts as a reflector. Drill a dozen or more ⅛-in. holes scattered throughout the tube to act as ventilators. Paint the outside a solid color to suit. When dry stand it end up on a newspaper and spatter three or four harmonizing colors over it, one at a time. Simply dip a brush into the paint, remove the excess, stand off about a yard from the tube, and with a snapping motion of the brush toward the lamp, flick on the paint in varied sized dots. With a little practice you will be able to control the size, the placements, and the number of these dots. When one color is dry spatter it with the second, a third, etc. Allow the paint to dry and give the whole a coat of clear varnish for a high finish.

Wire the lamp with the extension cord and insert a 10-in. tubular bulb. It makes a handsome looking bed lamp.

EDUCATIONAL ELECTRONICS

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ROBERT L. WHITTLE, and
THOMAS D. MINER
Public Schools
Garden City, N. Y.

(Continued from page 76 of the February, 1950, issue)

Experiment No. 2 — How Does an Amplifier Triode Work?

(*Reference* — Marcus and Horton, Sections 87, 88, and 89).

1. For this experiment you will need the neon tester, a 1.5 volt dry cell (a flashlight cell may be used), and a single pole, double throw switch. Be sure that you understand how the neon tester indicates the size of a voltage, and whether it is a.c. or d.c.

2. With the amplifier turned off, connect the tester, the dry cell, and the switch in the circuit as shown in Figure 1. Note that this connection enables you to connect the tester between plate and ground (when the switch is in position A), or to connect the dry cell in series as in position B. Thus the two voltages you are observing are different by 1.5 *v*, the voltage of the dry cell. Leave the rest of the circuit as shown in the schematic diagram,

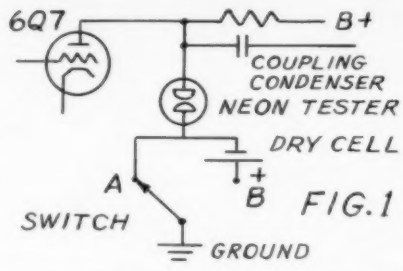


FIG. 1

except for the speaker which should be disconnected. What difference does the switch position appear to make in the glow of the tester? Reverse the dry cell, and observe the voltages again. How much of a voltage difference is required to make a noticeable difference in the glow of the tester?

3. Disconnect the grid from the input transformer, and connect the switch and dry cell in the grid circuit of the 6Q7, as shown in Figure 2. Note that this enables you to change the grid voltage by 1.5 *v*. Also connect the tester

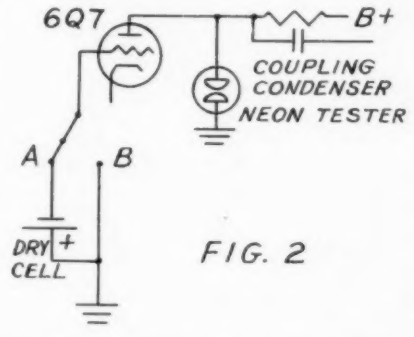


FIG. 2

from plate to ground as shown. Turn the amplifier on and notice the change in glow of the tester when the switch is changed from positive B to A. Compare this with the results of step No. 2. Does a 1.5 volt change in grid voltage cause a change in the plate voltage which is greater or less than 1.5 *v*? How does this illustrate the amplifying properties of the 6Q7?

4. Repeat step No. 3 — this time noticing particularly whether the plate voltage increases or decreases when the grid is made more negative by throwing the switch into position A. Reverse the dry cell so that the grid is made more positive with the switch in position A. Make a statement telling how much and which direction the plate voltage changes when the grid voltage changes. Explain.

Report

1. Record all the results in the experiment; and answer all the questions.
2. What does the word *amplify* mean?
3. What is the purpose of an audio-frequency amplifier?
4. Describe the construction of a triode.
5. Tell how the grid controls the flow of electrons through a tube.
6. What is the purpose of the resistor in the plate circuit of this tube? (See Marcus and Horton, sec. 110.)

Experiment No. 3 — What Is Meant by "grid bias?"

(*Reference* — Marcus and Horton, Section 108, and Chapter 20.)

1. With the amplifier turned off, and the speaker disconnected, connect the switch and dry cell in the cathode circuit of the 6Q7, as shown in Figure 3. Notice that this permits you to use the tube normally, when the switch is in position A, or to use the switch as in position B to make the cathode 1.5 volts more negative. Connect the neon tester from the

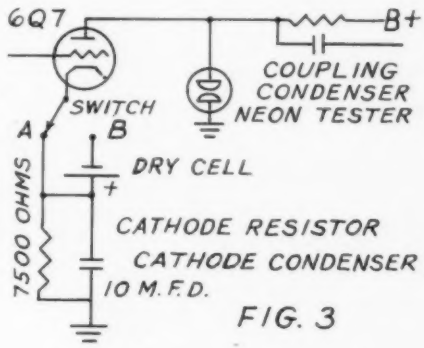


FIG. 3

plate of the tube to ground (B) as shown. Turn on the amplifier. What difference is made in the plate voltage when the cathode is made more negative? Refer back to step No. 4 in Experiment No. 2, and finish this sentence — "Making the cathode more negative (less positive) has the same effect as making the grid more ....."

2. Reverse the dry cell, so that when the switch is in position B it makes the cathode more positive, and repeat. How does this affect the plate voltage? Does the grid change its voltage at the same time? What happens to the current through the tube when the cathode is made more positive?

3. Remove the dry cell, and connect position B of the switch to ground, so that the amplifier is normal with the switch in position A, but the cathode is connected to the ground when the switch is thrown to B. How is the plate voltage affected when the cathode is grounded? Does the cathode register have the effect of making the cathode more positive or otherwise? Describe the voltage of the cathode with respect to the grid when the switch is in position B and when the switch is in position A, so that the resistor is used. Read section 134 in Marcus and Horton for the explanation.

4. Reconnect the amplifier so that it is ready for normal use. This means to remove the tester, the switch, and the dry cell from the circuit, and to replace the speaker. Turn the volume control up about halfway, adjust the position of the speaker so that there is no feedback, and put your finger on the grid-cap of the 6Q7. You should hear a hum from the speaker. (This is one of the quick tests used to see whether an amplifier is working). Turn the volume control to a position so that the hum is plain, but not disturbing. Now disconnect one terminal of the cathode bypass

condensor, and listen to the hum again. What change do you notice? Read section 135 in Marcus and Horton for the explanation.

Report

1. Tell what happened in each step of the experiment, and answer all the questions.
2. What is meant by grid bias?
3. Why should the grid be negative with respect to the cathode?
4. How do we get grid bias by the use of a cathode resistor?
5. What is the purpose of the cathode bypass condensor?

Experiment No. 4 — Tracing a Signal in the Audio Amplifier

(*Reference* — Marcus and Horton — Chapter 17.)

See also the diagrams, pages 72–75 in the February, 1950, issue.

1. In this experiment we are going to find out exactly how the electrical impulses from the microphone travel through the amplifier to the speaker. Instead of using the microphone to supply this *signal,* it is better to use a steadier source which can be easily turned on and off. For this purpose, connect the grid of the 6Q7 to the center terminal of the heater supply. This terminal is the one which has connected to it the double yellow wire from the power transformer, and is normally unused. Leave the microphone connected as usual, and just add this extra wire. Turn the volume control down, and turn the amplifier on. When it is warmed up, gradually advance the volume control. Describe the sound from the speaker. This sound has the same frequency as the voltage supplied in the power line from which you are running your set.

2. Disconnect the speaker, so that the noise from the following tests will not be distracting. Test the voltage which you are putting on the 6Q7 grid with the neon tester. What is the result? In view of what you know about the voltage required for the tube heaters, and since you know you are using half of this for the signal, what is the signal voltage?

3. Disconnect the signal, and test the voltage between the plate of the 6Q7 and ground. Is it d.c. or a.c.? Move the tester quickly to see whether or not it is steady. What is the result?

4. Reconnect the signal, and repeat step No. 3. What difference do you notice?

5. Repeat steps Nos. 3 and 4, with one terminal of the tester connected to the ground, and the other to the junction between the coupling condensor and the volume control. Be sure that the volume control is down all the way. Describe your results.

6. Repeat steps Nos. 3 and 4, with the tester connected between ground and the grid of the 6G6. Notice and record what happens as you advance the volume control. This result actually does not happen when the amplifier receives signals from the microphone, but is due to the extra large test signal we are using.

7. Now connect the tester from plate to screen of the 6G6. This puts it right across the primary of the output transformer so that you can study the voltage acting on the transformer which operates the speaker. Notice the results with and without signal, and how they change as the setting of the volume control is changed. Record this very carefully.

8. Make the same trial on the output side of the transformer (the terminals usually connected to the speaker). Read section 146 in Marcus and Horton for the explanation.

9. Disconnect the signal wire, and reconnect the speaker, so that the amplifier is ready for normal use. Now repeat step No. 7, speaking or whistling into the microphone for a signal. What are the results?

Report

1. Tell what happened in each step of the experiment, and answer all of the questions.

2. Refer to section 47 of Marcus and Horton for an explanation of an a.c. sine curve, and to Figure 84 on page 134 for a diagram showing how to indicate a.c. and pulsating d.c. signals. Now draw diagrams of the signals which you have observed at the following places: (1) The grid of the 6Q7. (2) Plate of the 6Q7. (3) The junction of the coupling condensor and the volume control, and (4) across the output transformer. Be sure to show whether or not the signal has been amplified, and whether it is true a.c. or pulsating d.c.

3. Where is the signal applied to an amplifier tube? Where is the signal, which has been amplified by the tube, taken from?

4. How does the signal get from the first stage to the second stage?

5. How does the signal get from the 6Q6 to the speaker?

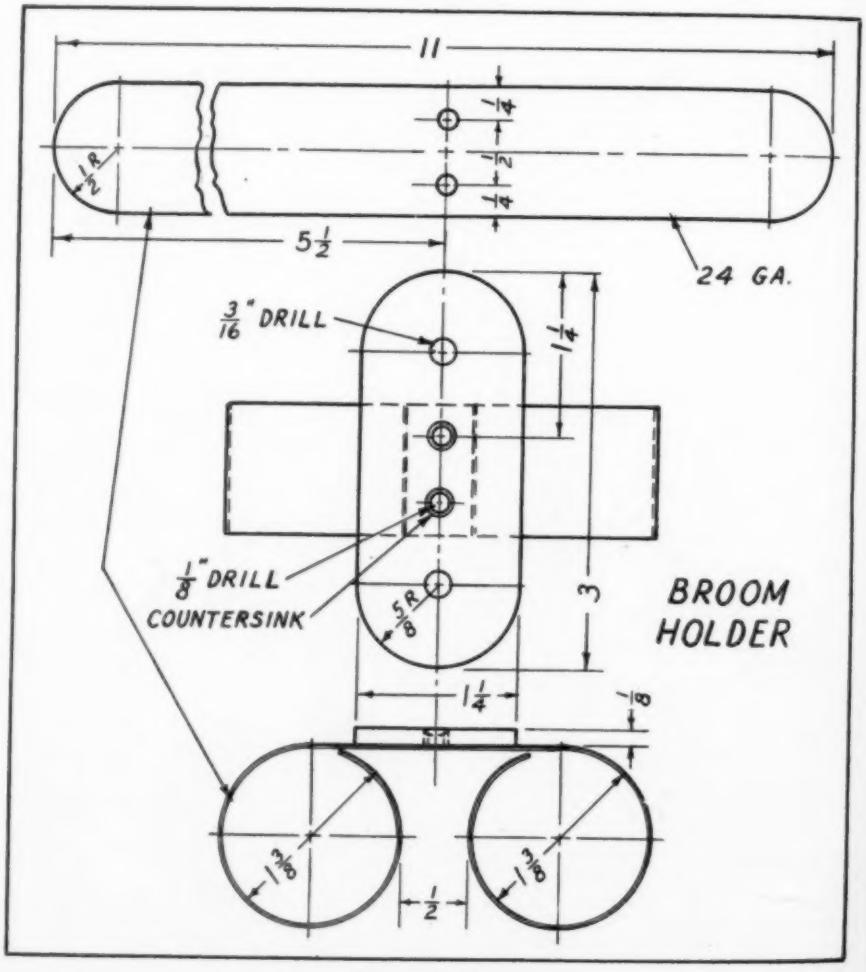
6. What is the purpose of the output transformer? What type of transformer is it, and why must it be this type?

(*To be continued*)

BROOM HOLDER

ROLAND J. LONG
Chicago, Ill.

This project is capable of holding brooms, garden tools, and many home workshop tools. The two loops which are formed by the holder provide adequate tension for a firm grasp on wood and steel handles.



Broom holder

The operations involved are such that it is recommended for the seventh or eighth grade, where it has been most successfully constructed during a one-year period. With certain modifications it can be adapted to the lower grades.

BILL OF MATERIALS

1 pc. steel stock, 1/8 by 1¼ by 3 in.
1 pc. steel stock, 24 gauge, 1 by 11 in.

Procedure

A. Holder
1. Draw center lines.
2. Round ends, center punch and drill 1/8- and 3/16-in. holes.
3. Remove all sharp edges.

B. Wall bracket
1. Draw center lines.
2. Round ends, and drill 3/16- and 1/8-in. holes.
3. Countersink the 1/8-in. holes.
4. Remove all sharp edges.

C. Assembly
1. Insert two rivets in holes on holder.
2. Pass rivets through holes on wall bracket so that countersunk side is away from holder.
3. Place project on riveting block, and strike rivets to fill countersunk portions.
4. File until excess is removed and back of bracket is smooth.
5. Bend holder to correct shape.
6. Paint the wall bracket.

TWO INTERESTING BIRDHOUSES

DICK HUTCHINSON

El Monte, Calif.

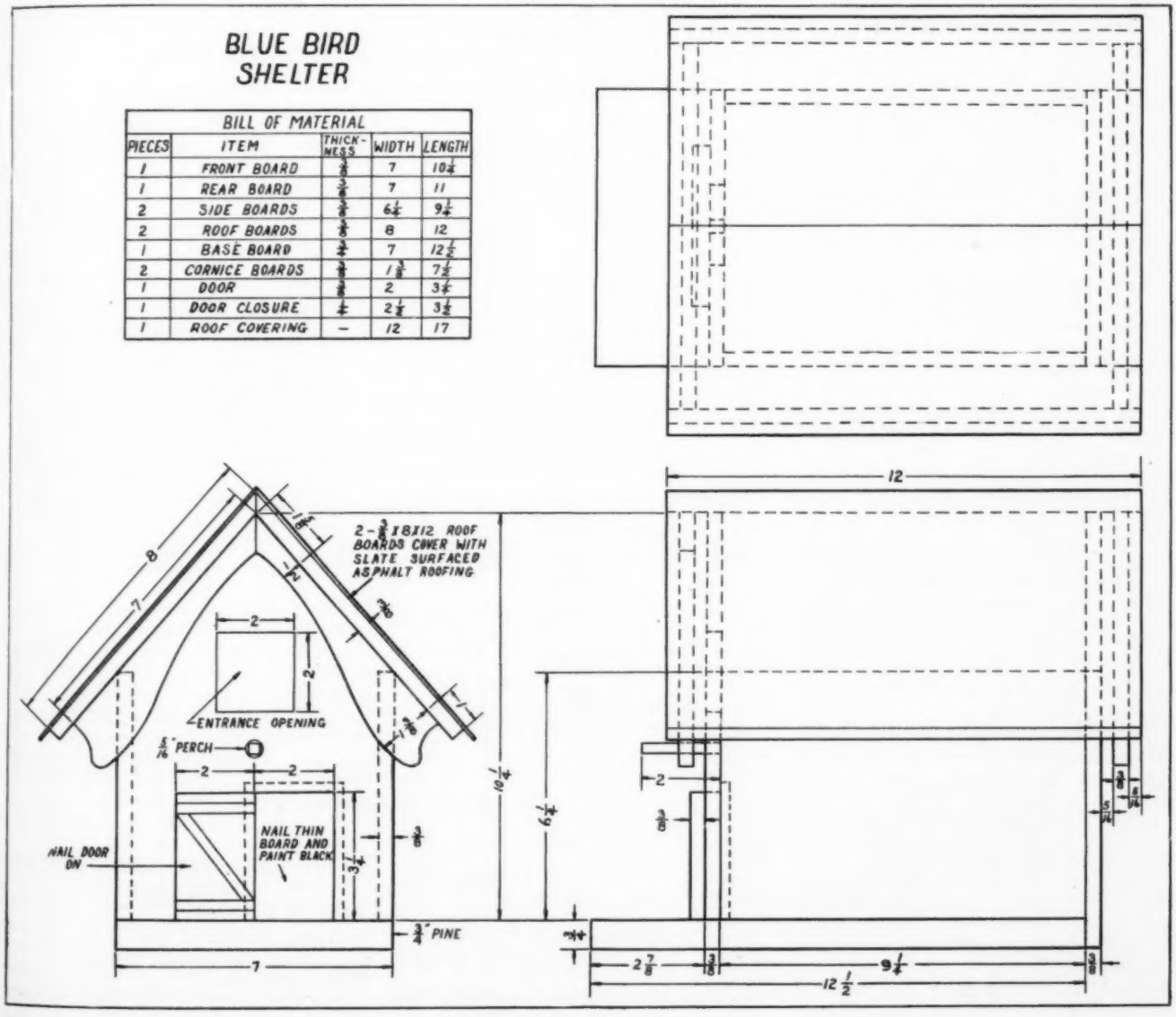
Birdhouses are most interesting projects for boys, and in addition to the real constructive fun they get out of building them, they get to know more about our birds, and are inspired with a desire to do more to perpetuate our wild bird life.

After more than a score of years of making the study of birds a hobby, and learning to really know them, and their habits, I have come to realize that without our birds, life would be pretty dull.

I have designed, and built many types of birdhouses, two of which are pictured here, and I know the kind of houses that birds will live in.

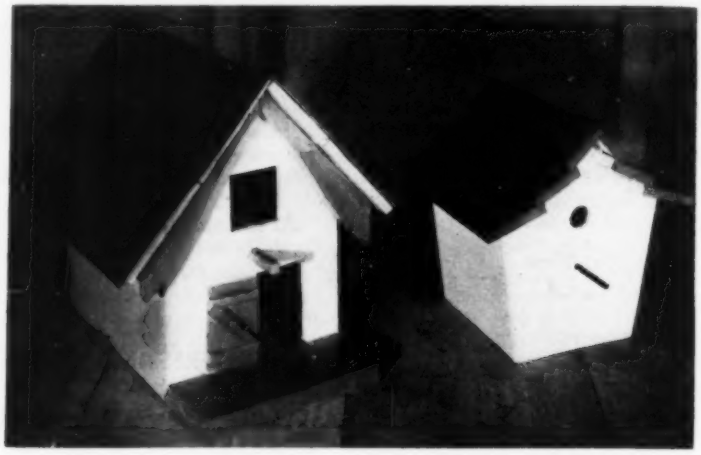
I have seen birds nest in plain, unpainted, drab looking shelters for want of something better, however, if a shelter is properly constructed, and painted in bright colors, the birds will fight to get possession of it. Birds like bright colors, and don't let anyone tell you different.

Two of our favorite, and most prevalent


BLUE BIRD SHELTER
BILL OF MATERIAL
PIECES | ITEM | THICK-NESS | WIDTH | LENGTH
1 | FRONT BOARD | 3/8 | 7 | 10 3/4
1 | REAR BOARD | 3/8 | 7 | 11
2 | SIDE BOARDS | 3/8 | 6 1/4 | 9 1/4
2 | ROOF BOARDS | 3/8 | 8 | 12
1 | BASE BOARD | 3/4 | 7 | 12 1/2
2 | CORNICE BOARDS | 3/8 | 1 3/8 | 7 1/2
1 | DOOR | 3/8 | 2 | 3 1/4
1 | DOOR CLOSURE | 1/4 | 2 1/4 | 3 1/2
1 | ROOF COVERING | — | 12 | 17
2-3/8 18X12 ROOF BOARDS COVER WITH SLATE SURFACED ASPHALT ROOFING
ENTRANCE OPENING
5/16" PERCH
NAIL DOOR ON
NAIL THIN BOARD AND PAINT BLACK
3/4" PINE
12
8
7
2
10 1/4
6 1/4
9 1/4
12 1/2
2 7/8

Details of bluebird house

Shelter for bluebirds or martins



Both houses completed and ready for service

species are the house wren, and the bluebird, so we will expend our energies in this particular case on building an attractive house for each of these birds.

Bluebird House

Picture the *Old Barn* bluebird house shown here. The piece in itself is attractive enough to grace any lawn, or garden, and the birds will love it.

A generous porch is provided, where one of the parent birds may rest while the other is nesting, or feeding the young ones.

The barn door is open . . . being nailed tightly in place . . . over the opening, however, is nailed a thin piece of wood, which is painted black to give the appearance of a dark interior.

Above the door is a squared 5/16-in. dowel perch, and above this is the entrance opening into a spacious interior.

The drawings illustrate clearly how the house is constructed, and all measurements are shown. The cornice trim pieces are nailed on under the gables at each end as illustrated.

This house is painted a light gray, with a dark gray trim, including porch, door, and perch, and a strip of red slate surface asphalt roofing is tacked on to cover the roof. Drill a ¼-in. hole in the rear end just under the roof for cross ventilation.

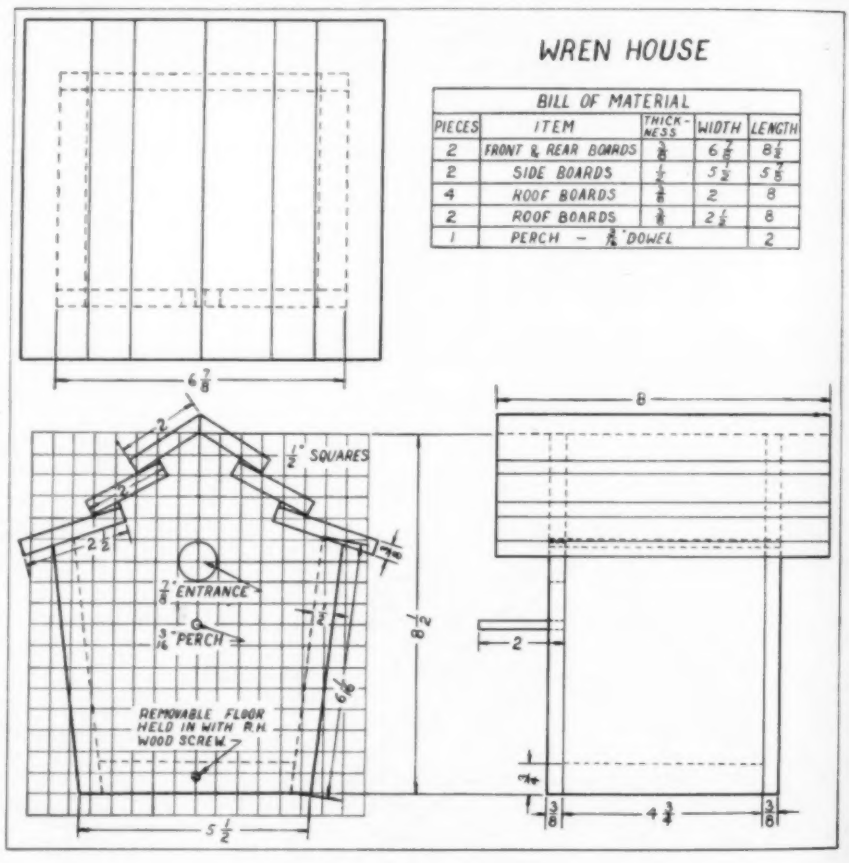
This shelter should be set on a post at least 8 ft. above the ground.

The Wren House

The tapering design, and the overlapping roof make the wren house of particular interest, and it is an easy one to build.

Lay out, and cut the front, and back pieces, also the sides, and assemble with brads, then cut the roof boards, and, beginning at the eaves, lay the roof on, with each board overlapping as shown.

The ¾-in. bottom board is cut to fit, and is held in place with R.H. wood screws, so that it may be removed for cleaning.


WREN HOUSE
BILL OF MATERIAL
PIECES | ITEM | THICKNESS | WIDTH | LENGTH
2 | FRONT & REAR BOARDS | 3/8 | 6 7/8 | 8 1/2
2 | SIDE BOARDS | 1/4 | 5 1/2 | 5 5/8
4 | ROOF BOARDS | 3/8 | 2 | 8
2 | ROOF BOARDS | 3/8 | 2 1/2 | 8
1 | PERCH - 5/16" DOWEL | | | 2
6 7/8
2
2
1/2" SQUARES
2 1/2
7/8" ENTRANCE
3/16" PERCH
1/2
8 1/2
6 1/8
REMOVABLE FLOOR HELD IN WITH R.H. WOOD SCREW
5 1/2
8
2
3/4
3/8
4 3/4
3/8

Details of wren house

Glue the dowel perch in, and drill a ¼-in. hole in the rear under the roof for cross ventilation.

Paint the house cream color, and enamel the roof with a good bright red enamel, and paint the perch black.

This attractive wren shelter should be hung from the limb of a tree, and in the shade.

TIN CAN SALT AND PEPPER SHAKERS

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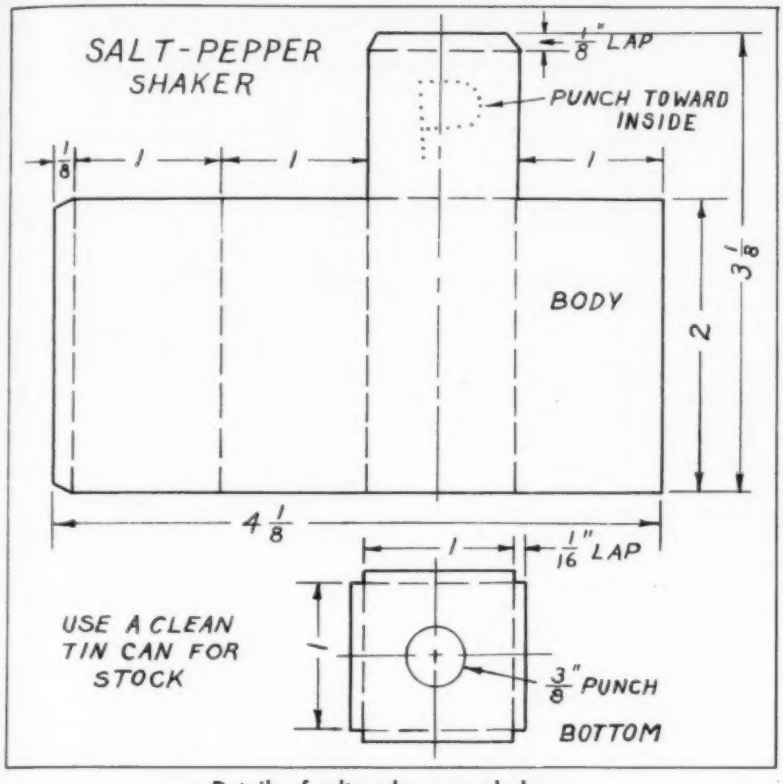
This small project is well suited for beginning classes in sheet metal on the junior high



Details of salt and pepper shakers

Tin salt and pepper shakers

school level. Only great care in the layout of the pair of shakers, and attention to an orderly method of procedure, will bring good results. The tendency of beginners on the soldering process is to load a joint with solder, while here, more than a slight amount of solder will ruin the job in both appearance and workmanship. The following general steps are used as a guide, and are not intended to take the place of the instructor's demonstrations and helping hand:

1. Get out the stock for the pair of shakers (tin can, tin snips).
2. Carefully lay out stock for the bodies and bottoms (combination square, scriber).
3. Cut out stock and notch (tin snips).
4. Punch S (salt) and P (pepper) on respective shakers (center punch, ball-peen hammer, hardwood block).
5. Punch hole in bottom (hollow punch, hammer, block).
6. Fold stock around hardwood form (two pieces 1 by 1 by 6 in., hardwood blocks, mallet, C clamp).
7. Solder lap seams and remove form (solder, soldering copper).
8. Fit bottom in place, ⅛ in. up from open end and fasten by soldering (pliers, solder, soldering copper).
9. Clean with steel wool and lacquer or enamel.

ELECTRICAL INSTALLATION AND PRACTICE — AN INSTRUCTION SHEET

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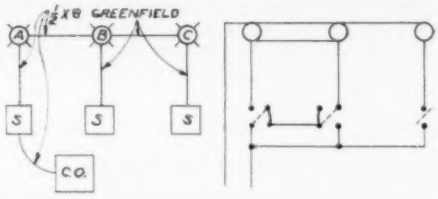
Exposed Flexible Conduit Two-Location and Independent Control

Object: To control two lights from two locations and feed another light that shall be controlled independently by a single pole switch. There shall be no more than four wires between the outlets *A* and *B*, which are tied in with a piece of ½-in. flexible conduit (Greenfield).

Job:

1. "Rough in" the job, using 4-in. octagon boxes at the light outlets and 4-in. square boxes at the switches. Connect the boxes, including the C.O. box, as shown in the conduit diagram, with 8-in. pieces of ½-in. flexible conduit.



2. Following the schematic wiring diagram, pull in the necessary wires for the job.
3. Test out the wires and make the splices.
4. Install the switches and the conduit receptacles (or W.P. sockets) and the C.O.
5. Install an equipment ground.
6. Cut in the feed, using one fuse and a lamp, and test for short circuits.
7. Lamp up and replace the lamp in the C.O. with a fuse.

Questions:

1. If the usual or conventional system of wiring a *3-way circuit* was used, how many wires would be required between outlet *A* and outlet *B*?
2. Why is this job more economical than if it was wired the usual or conventional way?
3. Why must Greenfield connectors be tightly clamped to the tubing and the box?
4. How many No. 14 S.B.R.C. wires are permitted in a ½-in. conduit?
5. State any advantage in wiring with "Greenfield" instead of "Armored Cable."

References: National Electric Code.

CONTROL PANEL FOR MODEL RAILROAD

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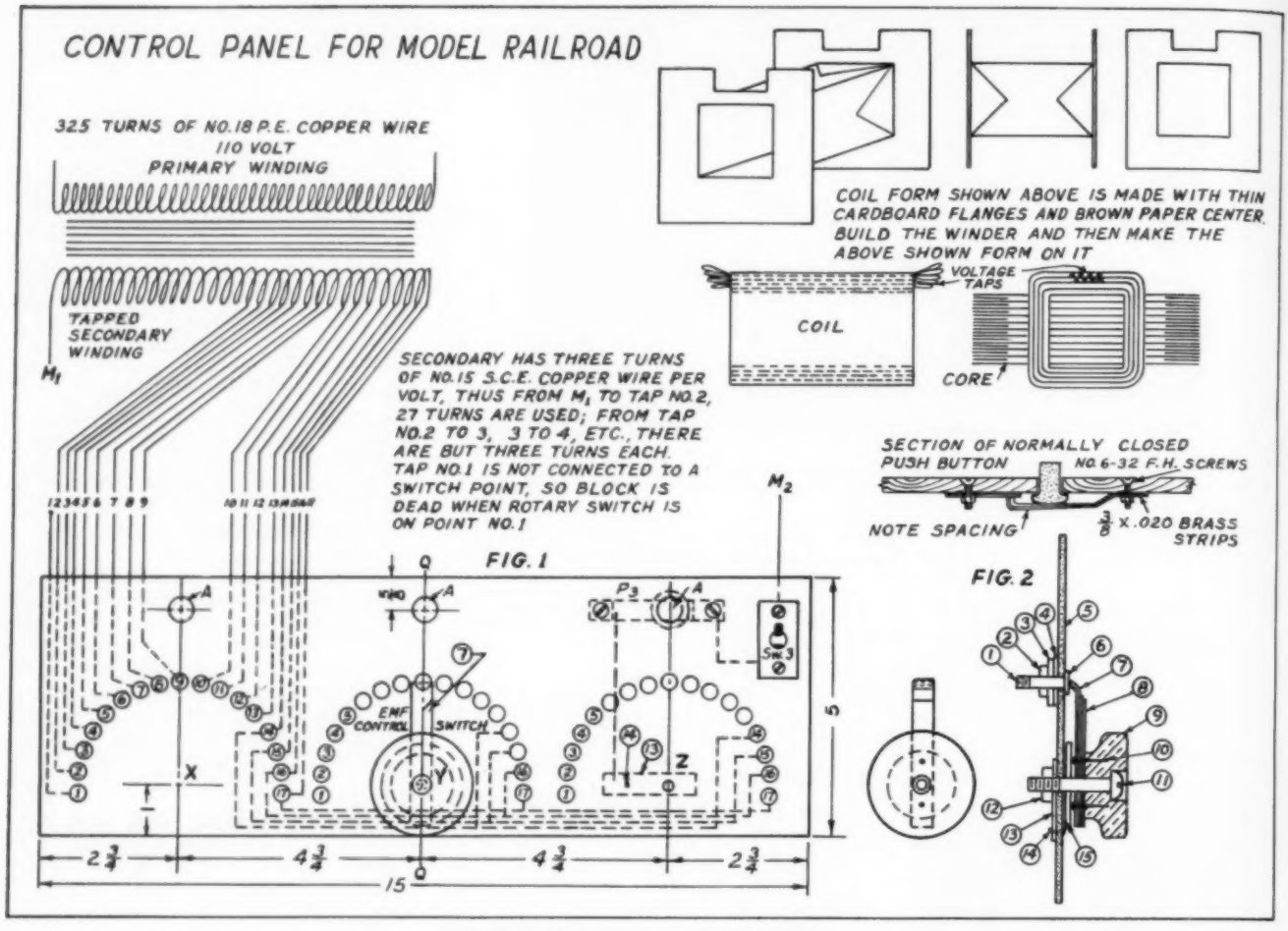
It is the purpose of this article to attempt a description of a self-made control panel which will be in such complete detail as to make it possible for any model railroad operator to build one like it or to add to it at will.

The panel and its essential parts are shown in Figures 1 and 2; the latter being a section of the panel through QQ. The system used has the advantage of being able to control actual voltages of trains on individual blocks rather than causing various voltage drops by means of resistors. This system makes it possible for the model railroader to design any line desired and still not have to build a lot of resistors (parts for which are often hard to procure), which often run hot when overloaded or become cumbersome to mount if load is added necessitating greater capacity.

The sketch in Figure 1 shows a panel with rotary switches for only 3 blocks, but any number of switches could be used as readily. Note that the transformer shown at the upper left of Figure 1 is figured and built for consecutive one volt steps, the first step No. 2 being (in the one we used) a nine volt step to cause each locomotive to start without "stalling along" and burning commutator and brushes. This first step can be of optional


CONTROL PANEL FOR MODEL RAILROAD
325 TURNS OF NO.18 P.E. COPPER WIRE
110 VOLT
PRIMARY WINDING
TAPPED
SECONDARY
WINDING
M1
SECONDARY HAS THREE TURNS OF NO.15 S.C.E. COPPER WIRE PER VOLT, THUS FROM M1 TO TAP NO.2, 27 TURNS ARE USED; FROM TAP NO.2 TO 3, 3 TO 4, ETC., THERE ARE BUT THREE TURNS EACH. TAP NO.1 IS NOT CONNECTED TO A SWITCH POINT, SO BLOCK IS DEAD WHEN ROTARY SWITCH IS ON POINT NO.1
FIG. 1
M2
EMF CONTROL SWITCH
X
Y
Z
2¾
4¾
4¾
2¾
15
5
COIL FORM SHOWN ABOVE IS MADE WITH THIN CARDBOARD FLANGES AND BROWN PAPER CENTER. BUILD THE WINDER AND THEN MAKE THE ABOVE SHOWN FORM ON IT
VOLTAGE TAPS
COIL
CORE
SECTION OF NORMALLY CLOSED PUSH BUTTON
NO.6-32 F.H. SCREWS
NOTE SPACING
⅜ X .020 BRASS STRIPS
FIG. 2

Wiring diagram for control panel

voltage, dependent on the desires of the individual. More about the *how* of the transformer will follow later.

In Figure 1 each of the 3 control stations has some parts missing to make the drawing more readable. At station X, Figure 1, we see all the switch points connected to the transformer secondary leads. It also shows points 14, 15, 16, and 17 connected to switch points 14, 15, 16, and 17 respectively of stations Y and Z. Of course, *all* the points of station X are connected in the same way to their respective counterparts at stations Y and Z. The blade of the rotary switch (No. 7, Station Y, Figure 1) is connected as shown at station Z to a push button switch (also self-made) of the normally closed type. (The *type* of switch is important.) Out of this switch the current passes through a snap switch shown as Sw 3, Station Z, Figure 1. Out of this switch the line M_2 passes to the rail of the block to be controlled. Thus, by rotating switch to the desired point the impressed voltage of *only that particular block* is changed.

Of course, though not shown, each station has a rotary switch, 17 one volt steps, a normally closed push button, and a snap switch. The rotary switches and transformer were the biggest thing to build.

The Rotary Switch

The one used had its points located on the arc of a circle of 2-in. radius. The switch points are made by facing off a part of the head of 10–32 by ¾-in. fillister head brass machine screws. The part of the head that remains after facing (face till slot for screw driver vanishes) must be the same on all points. If no small lathe is available, these can be filed down the proper amount. No. 1 in Figure 2 shows a section of a switch point and it shows a hole drilled into the end of it so wires may be readily soldered into each point. No. 2, Figure 2 is a 10–32 hexagon brass machine nut. No. 3 is a brass or steel washer of the spring or lock type, and No. 4 a plain flat washer. This washer combination is very helpful to prevent heat of soldering from loosening the switch point in the panel. This is particularly true if a plywood panel is used. We found tempered Prestwood an excellent panel material, and it is usually available in black as well as brown.

The rotatable blade of the switch is built up of .020 by ⅜-in. brass strip stock. Three pieces of required length for the bend as shown at No. 7, Figure 2, and two shorter pieces as shown at No. 8, Figure 2, are soldered together with all the parts in line at one end. The opposite end of the group will then have three equal pieces and two a little shorter protruding. The longer ones are bent a 90-deg. bend as shown at No. 7, Figure 2, and filed to operate smoothly while sliding from point to point on the panel. This built-up switch blade is fastened to a wood knob No. 9, Figure 2, by means of two brass or tinned iron brads No. 10 by first drilling the brass and the wood. Screw No. 11, Figure 2, is threaded through the switch blade to assure good contact with it. It then passes through a large fiber washer, No. 15, Figure 2 (which adds greatly to the smoothness of operation of the switch), thence through panel No. 5, Figure 2, thence brass strip 13, Figure 2 which is kept from rotating by brad No. 14, Figure 2. Brass strip is bent before mounting in order to give some tension for good contact against surface of nut No. 12, Figure 2. Nut No. 12 is carefully adjusted to give good contact and free operation of switch and then very carefully soldered so it will turn with screw No. 11. Brass strip No. 14 is for con-

nection to P_3 (the normally closed push button).

Use soldered connection and flexible wire such as motor *lead-in* wire or flexible *push-back* wire as used on radio wiring. Be sure switch points No. 1 to 17 are mounted very carefully so the switch blade will never leave one point till it has contacted the next as this will, of course, reverse a lot of trains by causing a temporary open circuit. We mounted the points in holes 7/16 in. between centers on the arc of a 2-in. circle. The nuts No. 12, Figure 2, were made by drilling and retapping a lot of 6–32 nuts for 10–32 thread. This resulted in a neat small nut which could not short-circuit on the next consecutive one.

The Normally Closed Push Button

The blade or spring is built up of the same material as used on the arm of the rotary switch already described. The sketch gives all details. Note how the shorter blades do not quite touch the next longer ones, thus assuring contact of each with the stationary contact. The button is turned on a lathe, made of fiber rod or a piece of good hardwood. This push button is for train reversal purposes.

The Transformer

An old burned out radio power pack transformer was used to supply the core, case, and mountings. Any type will do if it has enough core iron. We used one on which the center leg was of two and one quarter square inches cross-sectional area and having "windows" large enough for the desired winding. The winding used for the primary consisted of 325 turns of No. 18 plain enamel covered copper magnet wire. The secondary is wound right over the primary coil with taps taken off for 1 volt each (as shown in the drawing) after the first 27 turns have been put on. Each consecutive 1-volt tap should be numbered and tagged as it is wound. The sketches show how the taps are brought out of the coil so that their added bulk do not interfere with winding the coil in even layers. Be very sure (if your center leg on the core is not of square cross section) to bring out all leads where the core will not interfere with them. Make a very square form of heavy paper with flanges of same material and leave it in the finished coil for added insulation. *For safety* be sure to separate primary and secondary windings by winding one complete turn of carefully fitted heavy brown wrapping paper over the primary coil before you wind the secondary upon it. After the coil has been wound it can be carefully saturated with air drying insulating varnish (procurable from a motor rewinding shop), allowed to dry overnight and then removed from the winding form. If the varnish has penetrated and been allowed to dry well, it will make the coil almost indestructible from a mechanical point of view. In assembling the core, put in the iron very much as it was in the transformer you dismantled to get the core. Have the iron very tight in the coil being careful not to cut the insulation while inserting it. If necessary, use a small wood wedge to keep core well packed in center of coil. A little varnish will keep wedge from shifting while in use.

A little extra time spent in making a substantial winder, a good square form that runs true to its axis when rotated, and a well-squared coil form, will pay big dividends in the results attained and the unruffled temper with which this may be accomplished. There is a lot of satisfaction in building your own transformer and knowing that it is big enough for the load you have and has a good load safety factor.

ROUND TRIP CRIBBAGE BOARD

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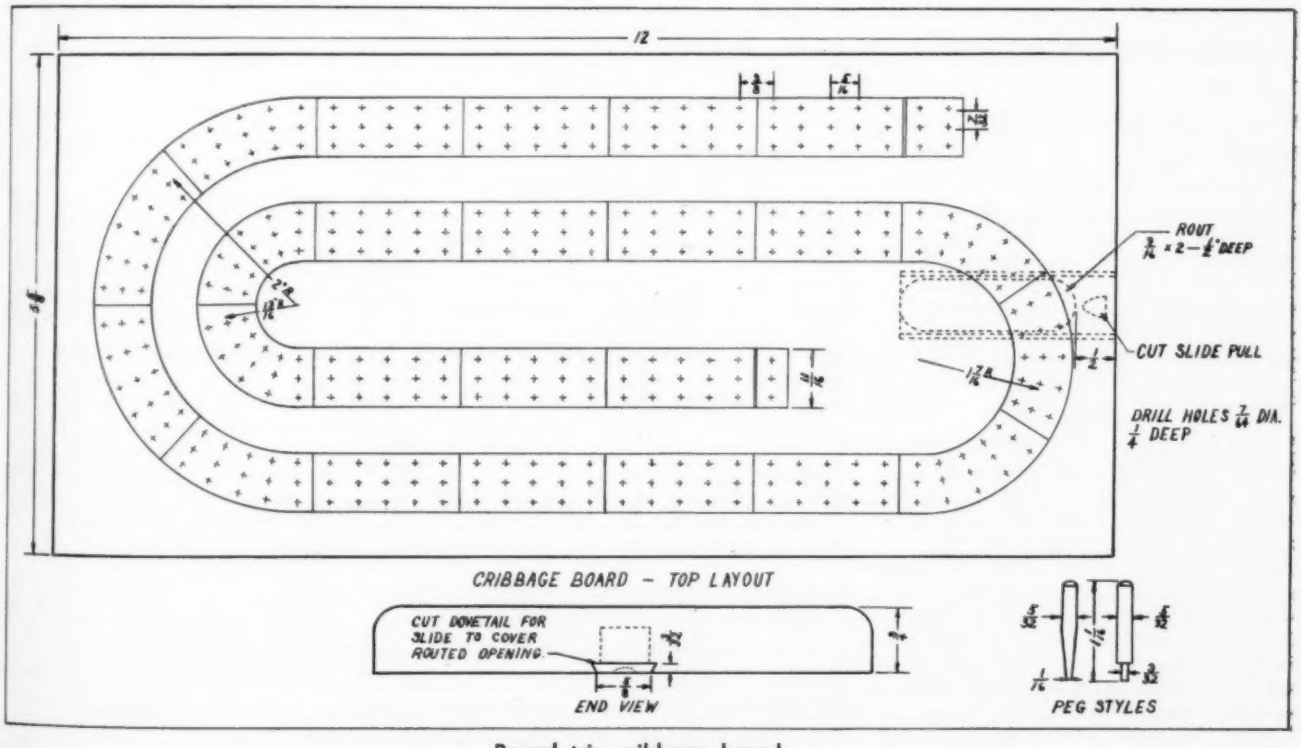
Everyone who plays cribbage has had the trouble of pegging the wrong way, or forgetting whether it is the first or second trip around the board. Here is a more foolproof type of board, because you start at the outside and peg one way, spiraling inward, over the entire 120 holes. Two, three, or four persons may play on it.

By adding or subtracting details, this project may be used for an extra or fill-in project for beginning, intermediate, or advanced woodworking students. It involves accurate layout, template making, squaring stock, shaping, boring, sanding, routing, inlaying, lathe work, and finishing.

The board shown was made of mahogany with aluminum satin-finish pegs. Lines were put on with India ink after filling up all the pores with lacquer sealer. The board and lines were then covered with seven coats of lacquer. For advanced students, the lines along the route of play may be inlaid with contrasting wood.

When drilling holes in the board, it is best to use a sheet-metal jig which has been laid out and drilled. It prevents the drill from



Round trip cribbage board

moving out of line by following the grain in the wood.

Pegs may be made from bronze or aluminum rod or wood dowels on the lathe. If no lathe is available, the chuck of a drill press may be used, and the pegs shaped with a file.

Suggested Plan of Procedure:

1. Lay out pattern of holes on paper.
2. Transfer layout to sheet-metal jig (approx. 20 ga.), center punch hole locations through paper.
3. Drill holes in jig 7/64 in. in size.
4. Remove the burrs from jig.
5. Select wood stock, using hardwood (try to get curly or attractive figure in the grain).
6. Square the stock to size with the plane.
7. Shape the edges, corners may be chamfered or rounded with the plane; or shaped with a rabbeting plane or shaper as shown.
8. Center the jig on board and drill holes 7/64 in. in diameter. To keep the top of the holes from chipping when the drill enters, clamp ¼-in. board between the jig and cribbage board, and use a depth gauge on drill.
9. Rout out the container for pegs on the back of the board.
10. Dovetail ⅝ in. wide by 3/32 in. deep for slide cover.
11. Cut a piece for the slide top 3/32 in. thick, saw or plane beveled edge to fit the width of the dovetail.
12. Sand smooth. If inlaying is done along the route of play, it should be inlaid before sanding.
13. Finish with durable finish (put on lines along the route of play after the pores are filled, and cover with transparent finish. Soap edges to make it work smoothly).
14. Make pegs.

PORTABLE BARBECUE GRILL

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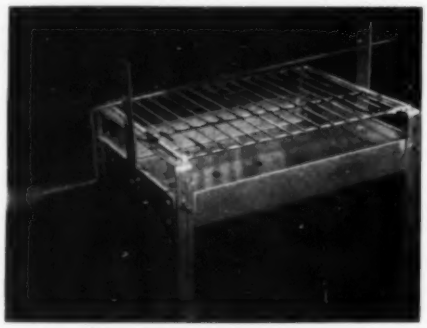
The need for a project that would combine the use of many of the skills learned in a junior high school general shop class, plus the desire for student interest, led to the development of this article. By the time an advanced student has completed such a project he has had ample opportunity to demonstrate his skill in the use of tools and equipment that are generally found in the school metal shop.

Procedure

Bottom: Lay out, cut to size, center-punch and drill all holes. Fold two edges ¼ in. completely over and lay down. Brake along center line to approximately 30 deg. Brake along 2-in. lines to form parallel sides.

Ends: Lay out, cut to size, center-punch and drill all holes. Fold top edge completely over and lay down. Fold remaining edges to right angles. Assemble ends and bottom by riveting together with 12-oz. rivets. (The ends and bottom may be tack-welded or brazed in place of riveting if desired.)

Legs: Cut, mark holes, center-punch and drill 1 3/64-in. holes. In order to obtain clearance for the grill support, it is necessary that the top holes on sides of legs be countersunk to allow use of a flat-head stove bolt. Mark holes from legs on assembled body of barbecue. Drill holes in body and assemble legs with 5/16-in. stove bolts.

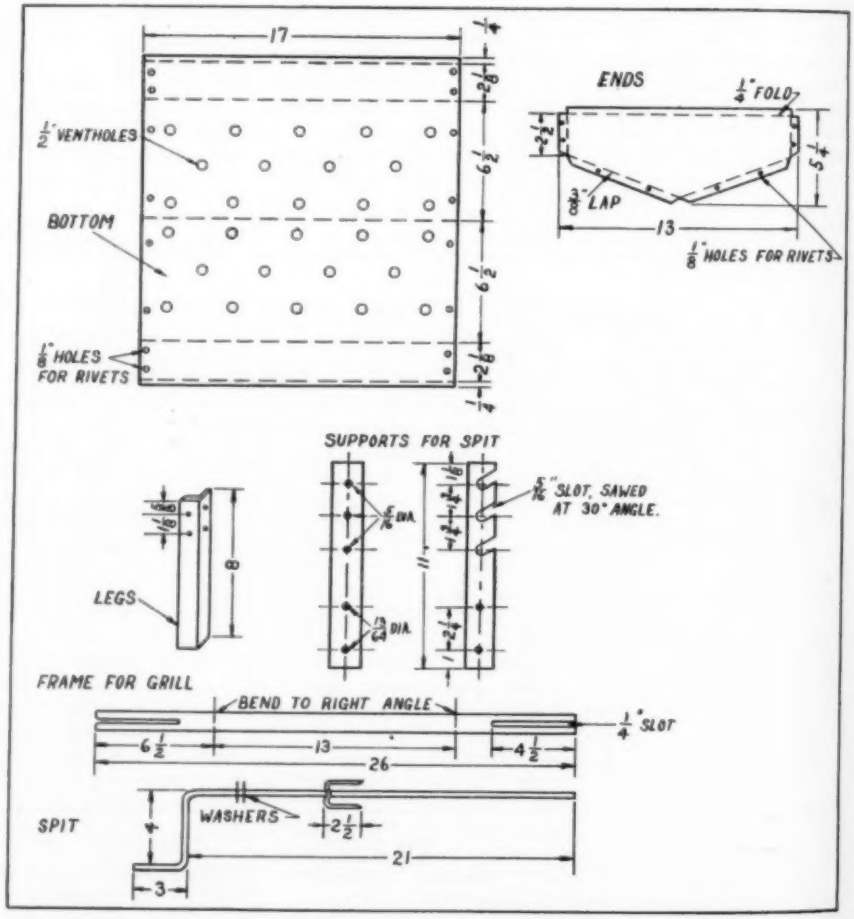


Portable barbecue grill

Supports for Spit: Cut, mark holes, and drill the three top holes 5/16 in. Drill bottom two holes 1 3/64 in. On one piece draw parallel lines 5/16 in. apart and at 30 deg. from the horizontal from each of the top three holes. Hack-saw along these lines to form slots to insert spit. Draw vertical center lines on each end of the body of barbecue. Center bottom holes of supports on center lines and mark the two holes. Drill 1 3/64-in. holes and assemble supports.

Frames for Grill: Mark parallel lines ⅜ in. along each edge to 4½ in. from the ends. Hack-saw along these lines and chisel out center strip at end of cut to form slots. Bend pieces in vise 6½ in. from each end to right angles. Place frames on body of barbecue and check for proper clearance. If proper clearance is lacking, the frames can be adjusted by replacing in vise and rebending. After clearance has been obtained, fasten in position by inserting 5/16 by 1-in. R.H. stove bolts through the legs and pulling tight with the wing nuts. The bolt head should be placed on the inside of the body and spot-welded or brazed in place to keep from turning.

Grill: An old refrigerator shelf makes an excellent grill and can generally be obtained for the asking from local appliance repair shops. These shelves are usually discarded from service when the coating of tin has worn off. It is often necessary to cut and rebuild such shelves to fit as a grill. Due to the type of steel used in such shelves a more satisfactory job can be done by brazing rather than welding the pieces together. After the shelf has been reassembled to the proper size



Portable barbecue pit

for a grill it should be brazed where the four corners rest on the grill frames. This should be done while the frames are held in position on the body by the wing nuts.

Spits: Mark; then bend into shape in vise with use of ball-peen hammer. For skewer on spit, make two right-angle bends 2½ in. from each end in vise. After bending, place both ends firmly in vise and tap in center with ball-peen hammer to form curve in center of skewer. Points may be either forged or ground on ends. Skewer may be either welded or brazed in position. Braze or weld washers in proper position on spit. Place spit in vise and drive on handle with mallet. An application of aluminum paint to all portions except the top of grill will greatly improve the appearance.

BILL OF MATERIALS

No. of Pieces	*Name*	*Material*	*Size*
1	Bottom	22-ga. black iron	17 x 17¾ in.
2	End	22-ga. black iron	5¼ x 13 in.
4	Leg	Angle iron (8-in.)	⅛ x 1 x 1 in.
2	Grill supports	Mild steel strips	⅛ x 1 x 26 in.
2	Spit supports	Mild steel strips	⅛ x 1½ x 11 in.
1	Skewer	Mild steel rod	5/16 x 7 in.
1	Spit crank	Mild steel rod	¼ x 28 in.
1	Handle for crank	Hardwood file handle	4½ in.
12	R.h. stove bolts for legs and spit supports		5/16 x ½ in.
4	R.h. stove bolts for legs and grill supports		5/16 x 1 in.
4	F.h. stove bolts for legs		5/16 x ½ in.
4	Wing nuts		5/16 in. or 10–24
2	Washers for spit		¼ in.
4	Washers for behind wing nuts		5/16 in.
16	Tinners rivets (12 oz.)		

AN EFFICIENT SHOP PUPIL PERSONNEL PLAN

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School-shops that are to function smoothly must have some type of pupil personnel plan. Basically, the majority of the jobs are the same but the manner in which they are administered varies. The following plan is being used for eighth– and ninth–grade slow learners and is very effective.

Shop Personnel Display Board

An important item is to try and dress up the various positions that are always frowned upon. Figure 1 shows an attractive display board which will aid in overcoming this task. The center section is finished with maple stain and shellac while the side panels are painted an attractive green. The lettering is bright red. The following materials are needed:

BILL OF MATERIAL

No. of pcs.	*Name*	*Material*	*Size*
1	Backboard	Plywood	¼ x 18 x 27
4	Center T strips	Pine	¾ x 1 x 17
2	End L strips	Pine	¾ x ⅝ x 17
1	Bottom strip	Pine	¾ x 1 x 18⅛
2	Side panels	Celotex	5¼ x 18

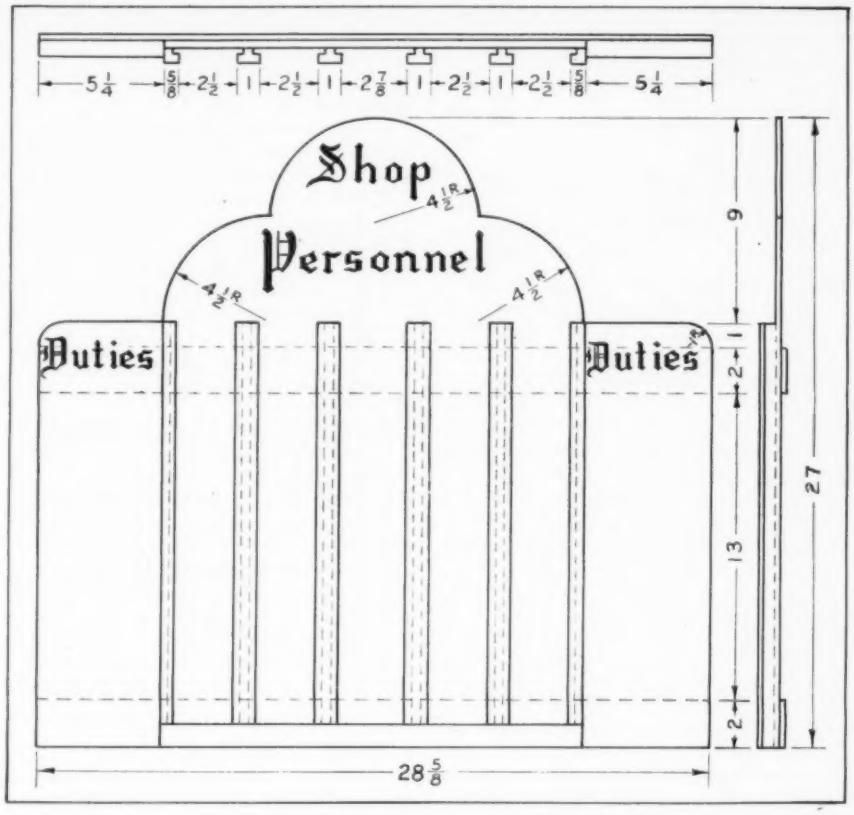


Fig. 1. An efficient shop pupil personnel plan

2	Fastening strips	Plywood	¼ x 2 x 28½
22	Center slides	Pine	⅛ x ¾ x 3
88	Side slides	Pine	⅛ x ¾ x 2¾

The construction is quite simple. The curves may be cut with a jig or band saw. The pine strips are shaped on the circular saw. The celotex, being a very soft material, will not dull the circular saw and may be cut with ease. The strips are fastened to the backboard with screws and glue. Four longer screws hold the fastening strips as well as the T strips. The celotex is glued to the fastening strips and aided with a few brads. The entire board is then shellacked. The celotex is painted and the lettering is completed. The center section is shellacked again or may be varnished if a high gloss finish is desired. The slides must be given one or two coats of shellac so that the ink will not run into the grain of the wood. The center column lists the names of the various shop officers. The side columns are for the pupils' names. In this case there is room for four classes but more may be added by making the center section larger in proportion. The top slide in each column is fastened to the backboard with a small r.h. screw.

Each pupil holds an office for a period of two weeks. At that time a new schedule is made out and the slides changed.

Duty Cards

The duty cards are 3 by 5-in. index cards with the duties of the various offices listed on them. They are fastened to the panels by staples and are given one coat of shellac to protect them against dirt. Figure 2 shows the duties of the paint man. Each job is simplified and short but covers duties completely. The duty cards are as follows:

PAINTS FOREMAN

1. **Cover paint cans, place in locker.**
2. **Hang all paint brushes in correct cans.**
3. **Place all rags and papers in waste cans.**
4. **Place two clean sheets of newspaper on the paint bench.**
5. **Sweep floor of paint room if necessary.**
6. **Have superintendent check your job.**

Fig. 2. Duties of the paint foreman

1. Superintendent

1. Be in charge of the shop if the teacher has to leave the room.
2. Assist the teacher in any duty he may call for.
3. Meet shop visitors and direct them to the teacher.
4. Mark cleanup sheet and check on all jobs at the end of the period.

2. Tool Foreman

1. Check to see that all tools are on the board. This is at both the start and end of the period.

2. Place all tools on tool board at the end of period.
3. Report any missing or broken tools to the superintendent.

3. Helper, Tools
1. Help the tool foreman in doing his job.

4. Machine Foreman
1. Clean off circular saw, buffer, jig saw, and the benches beneath these machines.
2. Report to superintendent if machines are broken.

5. Helper, Machines
1. Clean off grinder, jointer, miter box, drill press, and benches beneath these machines.
2. Report to foreman if machines are broken.

*6. Lathe No. 1 (Blue)**
1. Remove your work from the lathe at the end of period.
2. Clean off lathe and bench about five minutes before cleanup time.
3. Place all lathe and other tools in place on tool boards.

*7. Lathe No. 2 (Brown)**
Same as lathe No. 1.

8. Bench Foreman
1. Place all tools on bench near tool board.
2. Brush off long bench, hang up brush.
3. Close all vises.

9. Bench No. 1
1. Place all tools on bench near tool board.
2. Brush off both locker benches, hang up brush.
3. Close all vises.

10. Bench No. 2
1. Place all tools on bench near tool board.
2. Brush off both small benches, hang up brush.
3. Close all vises.

11. Materials Foreman
1. Place all scrap wood, metal, and sandpaper in proper places.
2. Place sandpaper blocks on rack, in order.
3. Place nail and screw boxes in rack.

12. Paints Foreman
1. Cover paint cans, place in locker.
2. Hang all paint brushes in correct cans.
3. Place all rags and papers in waste cans.
4. Place two clean sheets of newspaper on paint bench.
5. Sweep floor of paint room if necessary.
6. Have superintendent check your job.

13. Library Foreman
1. Arrange all books and magazines in rack.
2. Place project books and cards in rack.
3. Brush shelves, books, and planning table. Hang up brush.

14. Floor Foreman
1. After benches and machines have been cleaned, sweep floor around lockers and planning table.
2. Pick up sweepings on days appointed.
3. Hang up broom when finished.

15. Floor No. 1
1. After benches and machines have been cleaned, sweep floor around lathes to center of middle aisle.
2. Pick up on days appointed.
3. Hang up broom when finished.

16. Floor No. 2
1. After benches and machines have been cleaned, sweep floor around metal bench to center of middle aisle.
2. Pick up on days appointed.
3. Hang up broom when finished.

17. Safety Foreman
1. Pick up any tools on floor.
2. Report unsafe conditions to teacher.
3. Remove plugs from outlets at cleanup time.
4. Switch lights on if necessary.
5. Open windows if necessary.

18. Sink Man
1. Clean sink at the end of the period after all have washed.
2. Clean mirror.
3. Check to see if enough towels and soap are available.

*Lathes painted different colors to aid in tool replacement, etc.

Superintendent's Report

The superintendent's report, shown in Figure 3, lists all the jobs as they are on the shop personnel display. Next to each job the pupil's name is written and then the superintendent marks him each day on his cleanup job in the spaces provided. All officers are appointed by the teacher. Every pupil has a chance to become superintendent, the better ones receiving the position again later in the term. This marking and checking by the superintendent gives the teacher a chance to prepare for the next class. After the superintendent has marked the jobs the teacher may check or rerate them if he desires. These marks are averaged and then figured into the pupil's final mark.

Cumulative Shop Personnel Record

In order that a pupil will not be assigned to a job, say sweeping the floor, for two consecutive periods of two weeks, it is necessary to move the pupils a few spaces. The system of regular jumping will work fine until you have a class that is in the multiple of the number you are jumping. To avoid any duplication of jobs in close periods a cumulative shop personnel record is kept. Figure 4 shows that the jobs are again listed in the column on the left and the pupils' names on top. In

INDUSTRIAL ARTS DEPARTMENT
Superintendent's Report

1. Superintendent's Name ..... Class ..... Date .....

Job	*Pupil's name*	M	T	W	Th	F	M	T	W	Th	F	*Aver.*
2. Tool Foreman												
3. Helper, tools												
4. Machine foreman												
5. Helper, machines												
6. Lathe No. 1												
7. Lathe No. 2												
8. Bench foreman												
9. Helper, bench No. 1												
10. Helper, bench No. 2												
11. Materials foreman												
12. Paints foreman												
13. Library foreman												
14. Floor foreman												
15. Helper, floor No. 1												
16. Helper, floor No. 2												
17. Safety foreman												
18. Sink man												

If a pupil is absent it is your job to appoint a substitute for him. Mark AB next to the absent pupil's name and a (*) next to the name of the pupil that did the extra job.

You will fill this sheet out each day after examining the job done by each pupil. You will mark him as follows: A — excellent, B — good, C — fair, D — poor.

At the end of the two weeks, you will average the marks and place the total mark in the *Aver.* column, then turn the sheet in to the teacher.

Fig. 3. Superintendent's report

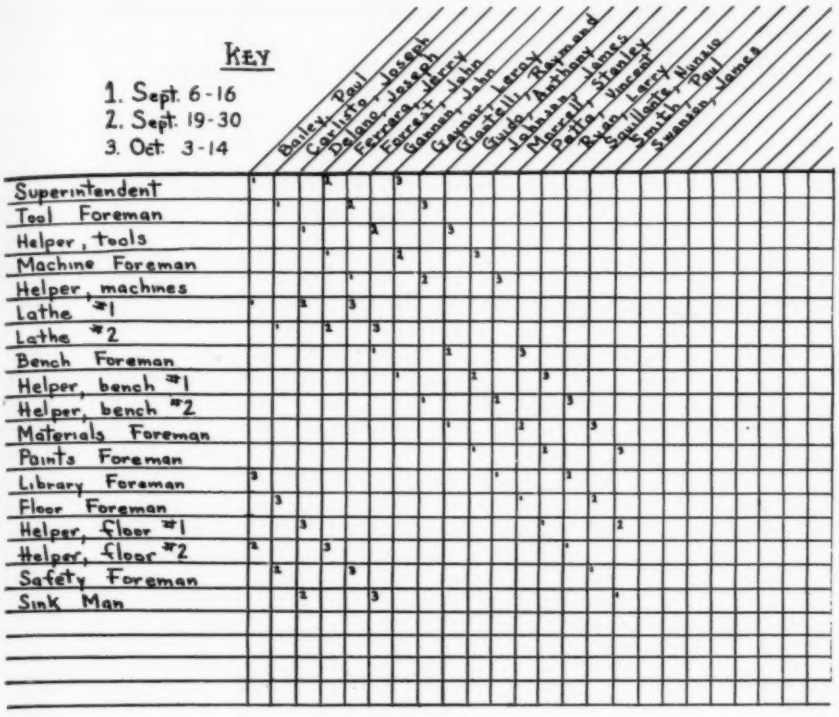


Fig. 4

the event that the number of jobs exceed the number of pupils, a few of the minor jobs may be omitted or doubled up. A key is located in the box in the upper left hand corner. It works as follows: No. 1 is the period from September 6 to 16. Therefore No. 1 will appear in the box opposite superintendent and Bailey's name. It will also appear opposite tool foreman and Carlisto's name, etc. The second period is from September 19 to September 30. In skipping three spaces we find Bailey is helper, floor No. 2. By a mere glance it is now possible to see what jobs each pupil has had at any time during the term. It aids in the making of new schedules and eliminates any pupil argument about the number of times he has had any position. It also contains a lathe schedule.

After the foregoing system has been started, it takes approximately 15 minutes to completely prepare a new schedule. It may take some time in organizing but the effectiveness of the system is well worth the effort.

LITHIUM

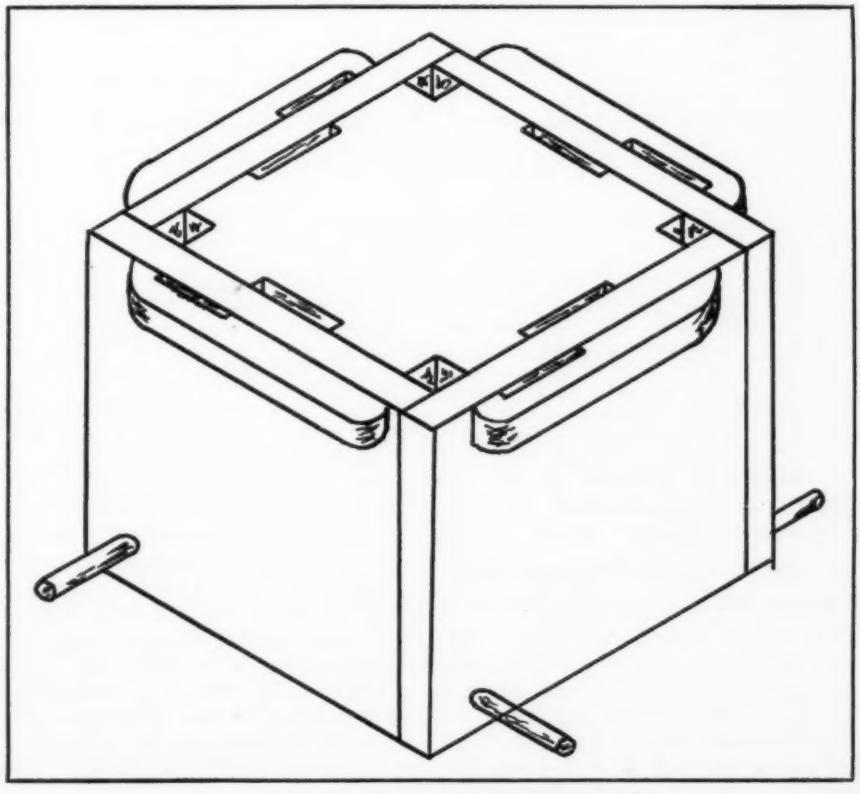
Lithium is the lightest of all metals with a density of .019 pounds per cubic inch — less than one third the weight of magnesium. It is very abundant and found in more than forty minerals on the earth's surface. In the pure state it is a white, soft element which can be cut with a knife. It tarnishes quickly in air and in moist atmosphere combines violently with nitrogen. The pure metal, therefore, must be kept submerged in water-free kerosene. Lithium is added to aluminum, copper, lead, and zinc base alloys in very small percentages as a grain refiner, to increase hardness, strength, and resistance to corrosion. It is also used for deoxidizing and desulfurizing steel and to refine the grain structure and increase the density of cast iron. — *Belmont — Metal of the Month.*

TOOL RACK FOR FOUR-PUPIL BENCH

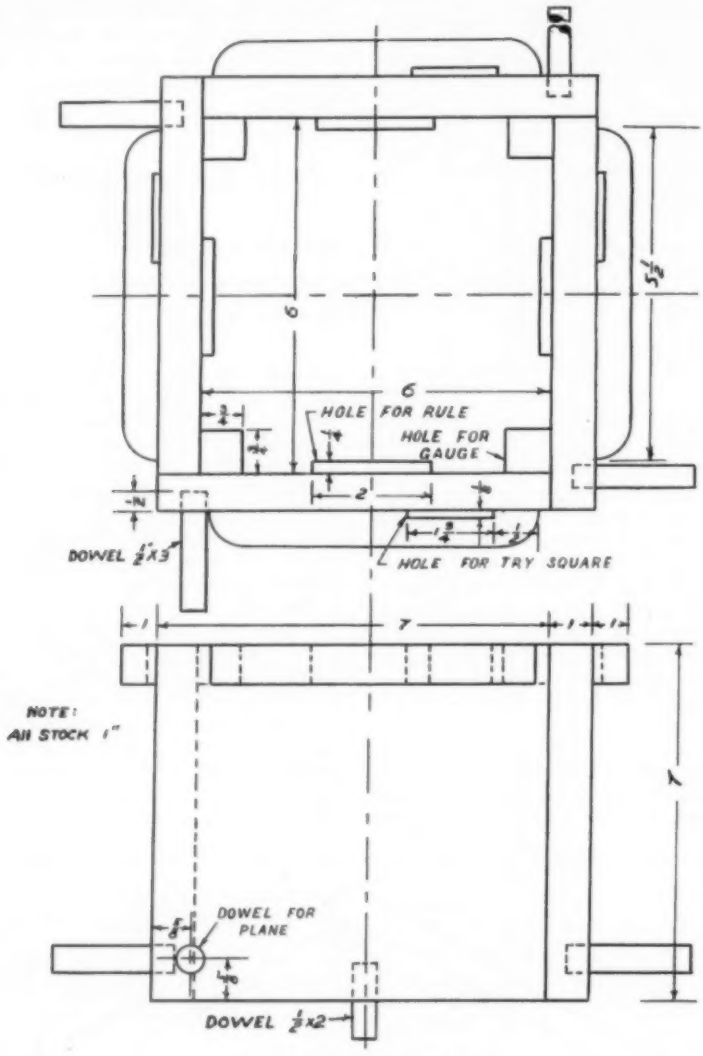
ARTHUR O. BERRY
State Teachers College
Gorham, Me.

In this day and age when all school shops are trying to conserve on space, the four-pupil bench has come into use as a means toward this end. With this type of bench, there is always the problem of having the common hand tools that each pupil uses in a handy place. In our shop the common hand tools are the 2-ft. rule, try square, marking gauge, and plane. The rack shown is our solution to this problem.

The rack is the same on all four sides. It has holes cut in the top into which the rules and marking gauges are placed and a strip on the side to hold the try square. The plane is held by a dowel projecting from the side. If other tools such as the knife and chisel are desired, there is ample room for cutting holes for them in the center of the top. The whole unit is held in the center of the bench by two dowels projecting from the tool rack



Tool rack for four-pupil bench



Details for tool rack

into the center surface of the bench. If a bench is required to work on large projects such as desks, the tool rack is lifted from the bench leaving a perfectly flat surface.

This rack has proved to be very satisfactory as well as being an attractive part of the bench.

WHAT IS NEEDED IN A ONE-MAN SHOP

F. C. FINSTERBACH

New York State College for Teachers

Buffalo, N. Y.

So much of what is needed in a one-man installation hinges upon adequate floor space. The normal unit for building area is the cubic foot because costs are figured on that basis. Yet we in the shops live on the floor and must deal with the square foot as a base regardless of the height of the ceiling.

When space is allotted, a room and a half or two rooms seems a great deal in comparison with other subject needs. In terms of cubic measure, this is true but unfortunately we are earth-bound with numerous machines, workbenches, cupboards, and active students whom nature provided with means of locomotion.

What then is a reasonable space unit? We need square feet; we are given cubic feet! How can we justifiably ask for more space when we are already given extra consideration? Let us begin, at least, to think in terms of pupil-units-of-space. When standing still the average individual takes up 2 sq. ft. of space. To sit, requires 4 sq. ft. To sit or stand at an average size 2 by 4-ft. workbench, takes *four times two plus sitting room* or 12 sq. ft., without allowing for aisles of travel or movement of any kind. Thus the average class of 20 needs 240 sq. ft. just to stand still and breathe in a shop. That alone requires a 15 by 16-ft. room. The average classroom unit provided only three times this breathing space!

The absurdity of trying to crowd machines, work stations, students, and services into a unit and a half or even two units is known to all of us. We must convey this idea to others, principally school architects, administrators, and budget officials. Living space is essential to the healthy and vigorous growth of our work. We must not be "rock bound" at the very beginning.

What shall we settle for as a beginning? May we suggest 100 sq. ft. per pupil. A shingle square, 10 by 10 ft., is little enough. That would make a total shop area of 2000 sq. ft. for a teacher load of 20 students, which, by the way, we may say is the maximum *safe* load for any one teacher in a shop.

In this shop should be found the following services: hot and cold water; a steam service outlet; compressed air outlets, high and low pressure; gas; 110-volt lighting, 220-volt power and low-voltage d.c. current; a drinking fountain; a wash sink; a slop sink with a large diameter drain. If photography and dyeing of fabrics are to be included then additional sink facilities are necessary.

The heart and core of the industrial-arts laboratory may be said to be the *Planning Center* around which all other activities should be spaced. Space does not permit me to go into detail regarding the subdivisions of this area, but at least one eighth of the total floor should be assigned to this center alone.

Next, well-defined aisles of travel should be made to radiate either from the planning center or circulate around the outside of the room about 6 ft. from the wall. This would then allow the location of machines, benches, and equipment around the wall and to both sides of the planning center, thus dividing the room into relatively dirty and clean work areas.

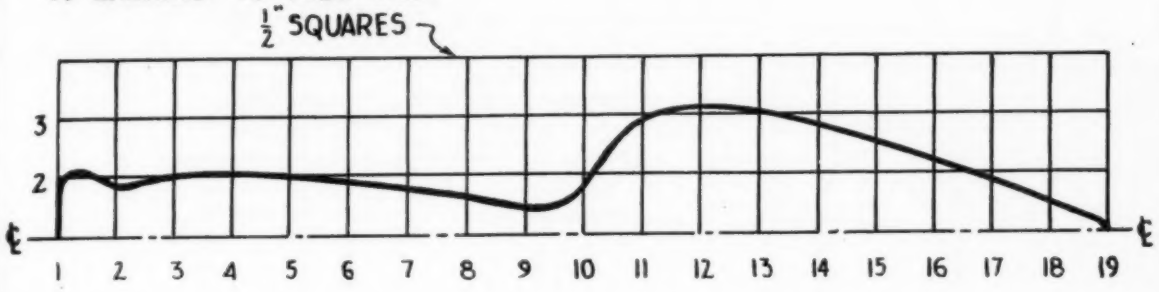
The tools should be kept on open panels, localized near the various work areas with some sort of a color code to facilitate rough classification, and self-teaching and self-inventory name plates for each separate type of tool. Under the panels, small equipment and service supplies could be stored. Over the panels, a display shelf would be constructed. Such tools as were common to many activities could, of course, be placed on a central panel. Small, delicate, and easily lost tools should be placed on a cabinet equipped with a glass paneled door which can be locked.

In the planning area itself, there should

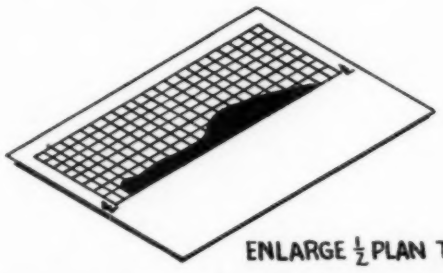
(Continued on page 177)

Plans for a cake lifter . . . . . .

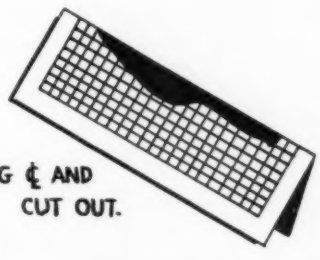
1. ENLARGE TO FULL SIZE.



2. AFTER ½ PLAN IS ENLARGED TO FULL SIZE FOLD ALONG ℄ AND CUT OUT.



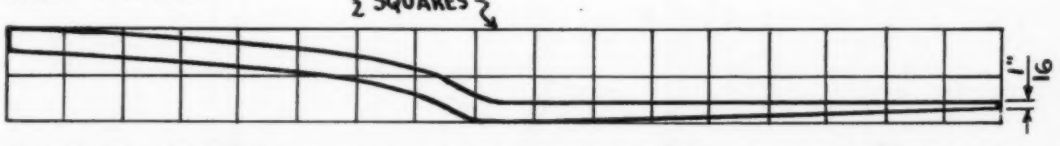
ENLARGE ½ PLAN TO FULL SIZE.



FOLD ALONG ℄ AND CUT OUT.

3. TRANSFER PATTERN TO ¼" THICK LUCITE OR PLEXIGLAS.

4. CUT OUT, SHAPE BLADE, SMOOTH WITH FILE AND SANDPAPER, THEN POLISH.



SHAPE THE UNDERSIDE OF THE BLADE ON A DISK SANDER. AFTER POLISHING, WASH THOROUGHLY WITH SOAP AND WATER OR WITH A CLEANER, THEN BEND TO THE SHAPE. IF SEVERAL ARE TO BE BENT MAKE A JIG FROM SOFT WOOD.

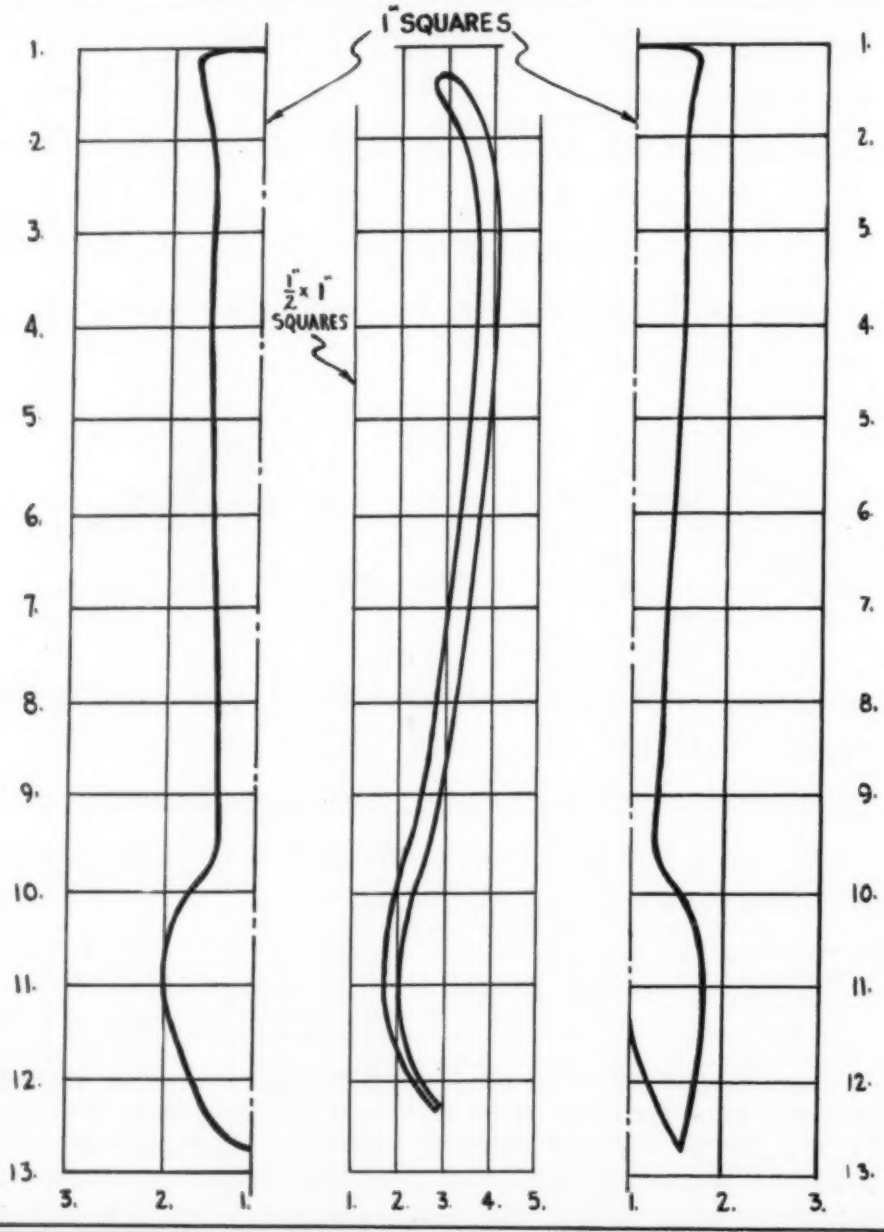
5. INITIALS MADE OF 1/16" PLASTIC MAY BE CEMENTED ON THE HANDLE.

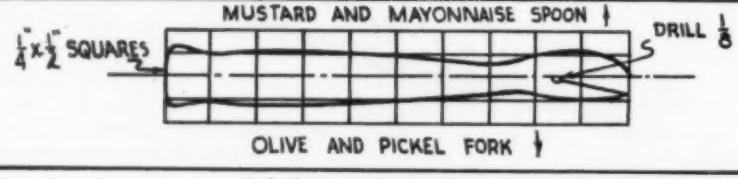
DESIGNED AND DRAWN BY—
JOHN R. WALKER

Cake lifter submitted by John R. Walker, Bel Air, Md.

Plans for a salad set

1. THE PROCEDURE FOR MAKING THE SALAD SET IS THE SAME AS USED IN MAKING THE CAKE LIFTER. ALL PLASTIC $\frac{1}{4}$" THICK.

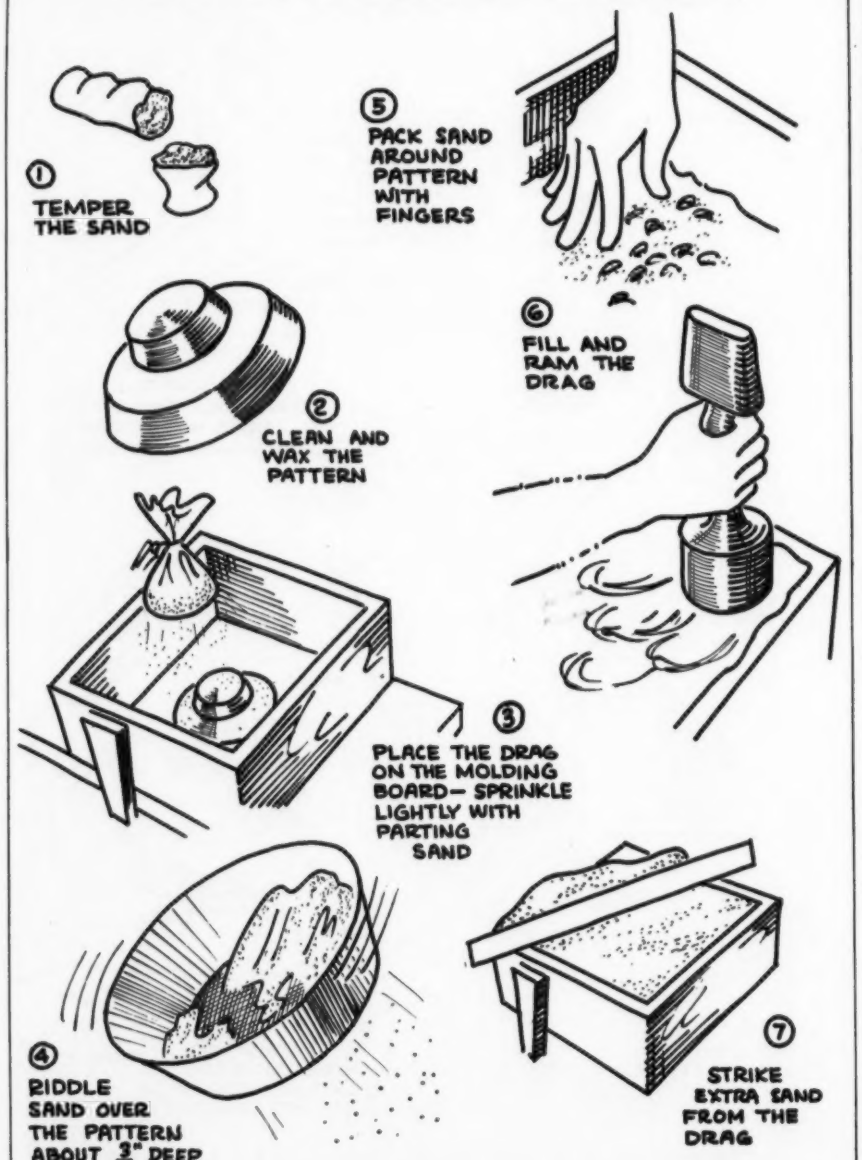




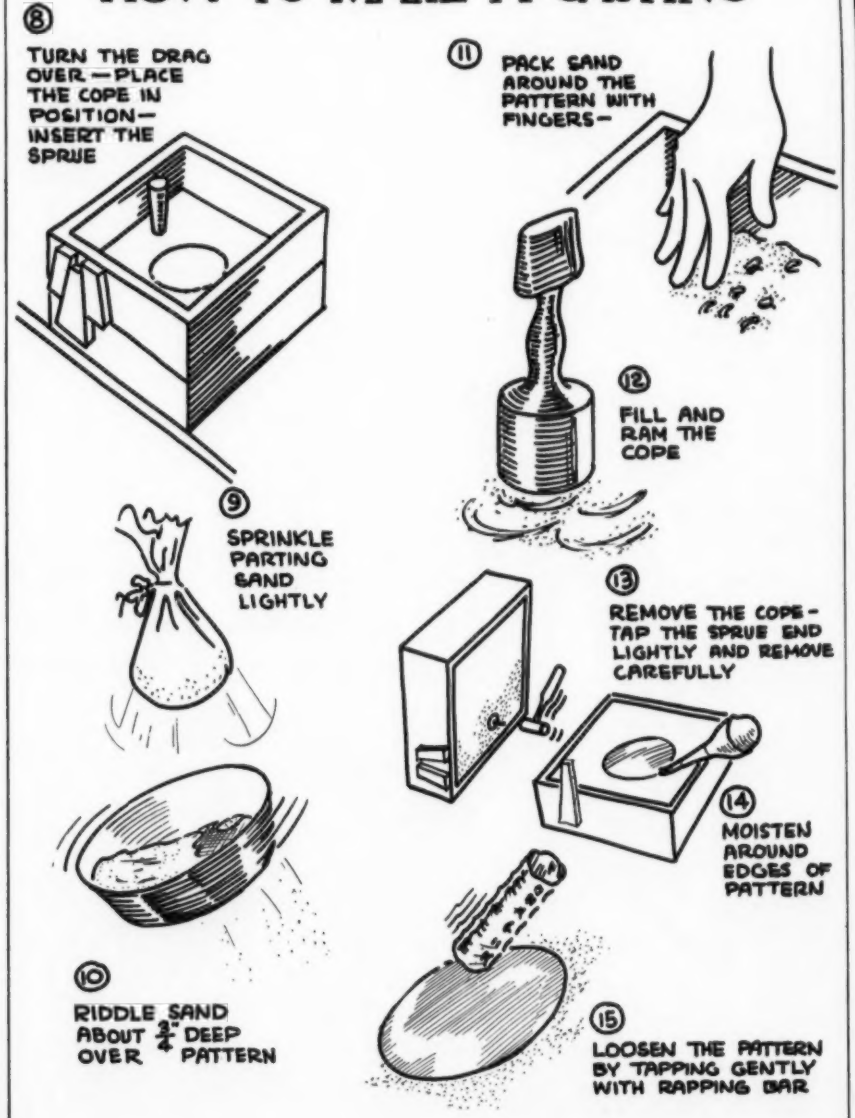
DESIGNED AND DRAWN BY JOHN R. WALKER

Salad set submitted by John R. Walker, Bel Air, Md.

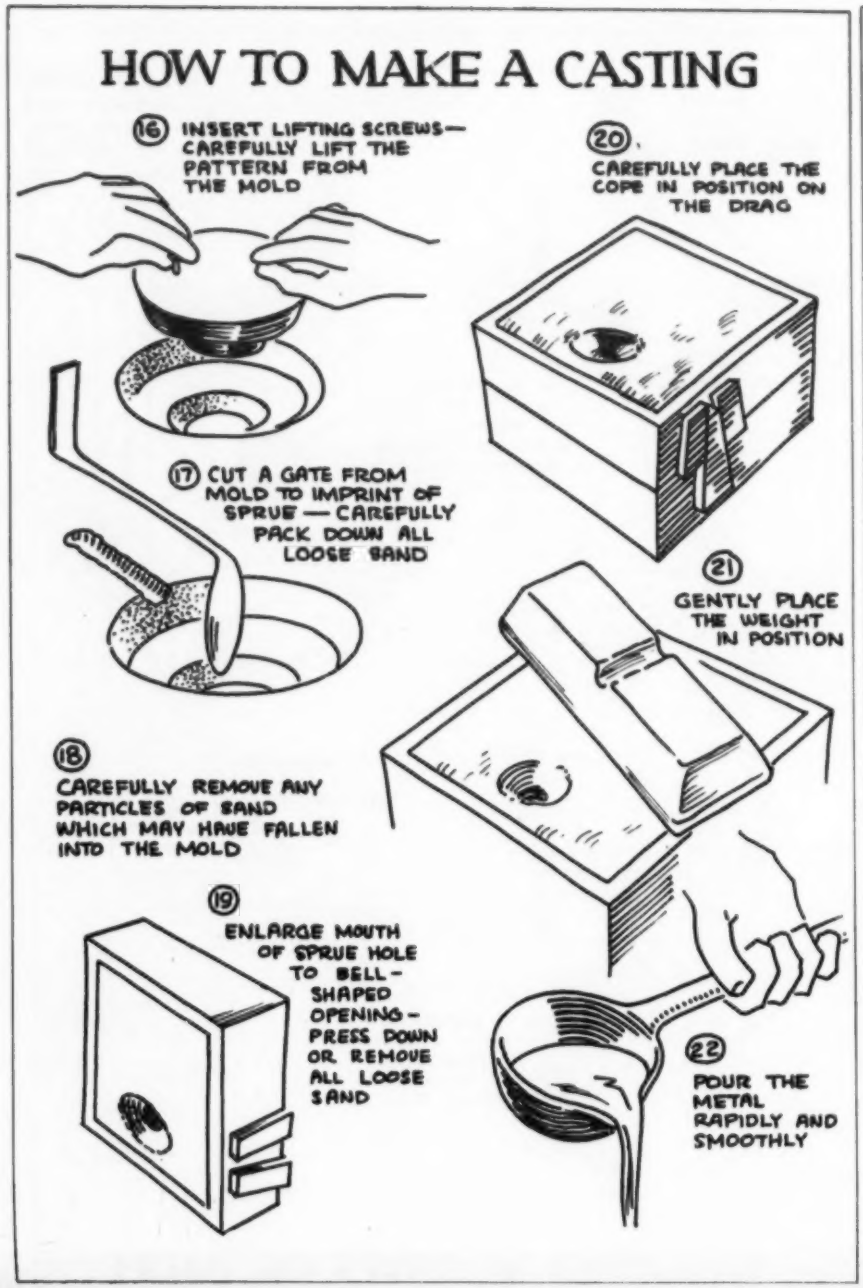
HOW TO MAKE A CASTING


1 TEMPER THE SAND
2 CLEAN AND WAX THE PATTERN
3 PLACE THE DRAG ON THE MOLDING BOARD— SPRINKLE LIGHTLY WITH PARTING SAND
4 RIDDLE SAND OVER THE PATTERN ABOUT 3/4" DEEP
5 PACK SAND AROUND PATTERN WITH FINGERS
6 FILL AND RAM THE DRAG
7 STRIKE EXTRA SAND FROM THE DRAG

HOW TO MAKE A CASTING


8 TURN THE DRAG OVER — PLACE THE COPE IN POSITION— INSERT THE SPRUE
9 SPRINKLE PARTING SAND LIGHTLY
10 RIDDLE SAND ABOUT 3/4" DEEP OVER PATTERN
11 PACK SAND AROUND THE PATTERN WITH FINGERS—
12 FILL AND RAM THE COPE
13 REMOVE THE COPE - TAP THE SPRUE END LIGHTLY AND REMOVE CAREFULLY
14 MOISTEN AROUND EDGES OF PATTERN
15 LOOSEN THE PATTERN BY TAPPING GENTLY WITH RAPPING BAR

Charts on foundry safety and practice submitted by George Welch, Dalton, N. Y.


HOW TO MAKE A CASTING
16 INSERT LIFTING SCREWS— CAREFULLY LIFT THE PATTERN FROM THE MOLD
17 CUT A GATE FROM MOLD TO IMPRINT OF SPRUE — CAREFULLY PACK DOWN ALL LOOSE SAND
18 CAREFULLY REMOVE ANY PARTICLES OF SAND WHICH MAY HAVE FALLEN INTO THE MOLD
19 ENLARGE MOUTH OF SPRUE HOLE TO BELL-SHAPED OPENING - PRESS DOWN OR REMOVE ALL LOOSE SAND
20 CAREFULLY PLACE THE COPE IN POSITION ON THE DRAG
21 GENTLY PLACE THE WEIGHT IN POSITION
22 POUR THE METAL RAPIDLY AND SMOOTHLY

FOUNDRY
SAFETY
KEEP OUT OF THE WAY!
WHEN METAL IS BEING POURED
WEAR GOGGLES AND GLOVES - SAVE YOUR EYES AND HANDS!
NEVER POUR MELTED METAL INTO A WET MOLD -OR- THROW WET METAL INTO A LADLE OF MELTED METAL
DON'T TOUCH!
IT MIGHT BE HOT

Charts on foundry safety and practice submitted by George Welch, Dalton, N. Y.

THE ONE-MAN SHOP

(Continued from page 172)

be two large tables, and enough portable chairs to seat a class. There should also be drawing facilities for four students; a magazine display and storage case; a bookcase; a chalk board; a visual aids cabinet; a screen; and a showcase.

Corners can be made specially helpful to the teacher. In fact, it is well to create two additional corners by placing a half-glass finishing room against the center of one wall. These extra corners, then, with local lighting, would serve as focal centers for a variety of activities, each more or less self-contained, yet accessible and observable from any other part of the room.

What areas of activity are to be offered in the shops is one of the most controversial subjects that can be brought up in any gathering of teachers. Since some conclusion must be arrived at, however, it may be well to start with the basic statement, that the school shop should provide opportunity for the boy to do better the things he would do anyway. That, of course, covers a wide variety of activities, but the school shop *can* and *should* provide them. Then there may be other additional activities provided for, requiring equipment and tools and materials that would continue to challenge his ability, his inventiveness, his ingenuity, and his desire to create new and better things for a new and better living.

The author is quite unwilling to see a boy put to work on an airplane when his own bicycle, parked in the school yard, needs repairs. He is loath to see a boy tooling a fine leather wallet when the sole of his shoe flaps on his foot! He also is disturbed when the boy does fine cabinetwork in school, while the family pays to hire a workman to make simple repairs that the boy could readily make himself. It is just as disturbing to watch a boy weave an elaborate table runner, while his elbows stick out of his sweater, and his suit gives evidence that it has not as yet been introduced to a pressing iron and a cleaning process.

It seems safe to say that shop organization based upon materials, woods, metals, plastics, fabrics, etc., has more promise of stability than organization around trade divisions, though trade divisions do break down into convenient processes and operations.

However, if we want to take the larger units suggested by Bonser, foods, clothing, shelter, tools, utensils, etc., we do, in effect, come right back to materials. If we deal with the proposed units of the new curriculum such as power, construction, transportation, communication, and manufacturing, we would, in the end, particularly with construction and manufacturing, have to organize around materials, in order to make practical application of the new definition.

Pending development and further interpretation of this latest concept there appears to be considerable basis for the inclusion of areas of work involving woods, metals, plastics, textiles, leather, ceramics, graphic arts, and electricity. These, it seems, should be offered in varying amounts in the one-man shop.

If one were asked to name the one single factor that is essential to the successful running of the generalized shop, the author feels that "organization" would have to be that word.

It means to bring into systematic relation all parts of a whole. When that is done, be it in a one-man or in a six-man shop, we are bound to have some success. When this essential factor is neglected, failure will inevitably result.

To what fine degree organization should be carried out may be illustrated by a simple example.

A can of paint needs opening and mixing. Does the boy need to travel 20 ft. to get a tool suitable for opening it and another 20 ft. to search for a stirring stick, or is there an opener and a metal stirring paddle available right at hand? Carry that amount of detail into all units of work and the problem of many activities under the leadership of one man can be reduced to a minimum.

Add to this organization a colorful atmosphere, make it functional, keep the shop clean and orderly, and much of the headache and heartache involved in the generalized shop will disappear.

It will take work and plenty of it, but it need not all be done by the teacher. If it is a new shop insist that much of the equipment that the teacher is now expected to make be purchased as necessary items. If it is an old shop needing reorganization, knock off regular activities for ten weeks and give the student the rich experience that will come from a complete rejuvenation of the shop. This method works with both youngsters and with older students.

ELECTRICAL INSTALLATION AND PRACTICE — AN INSTRUCTION SHEET

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Rigid Conduit — Offset Bends

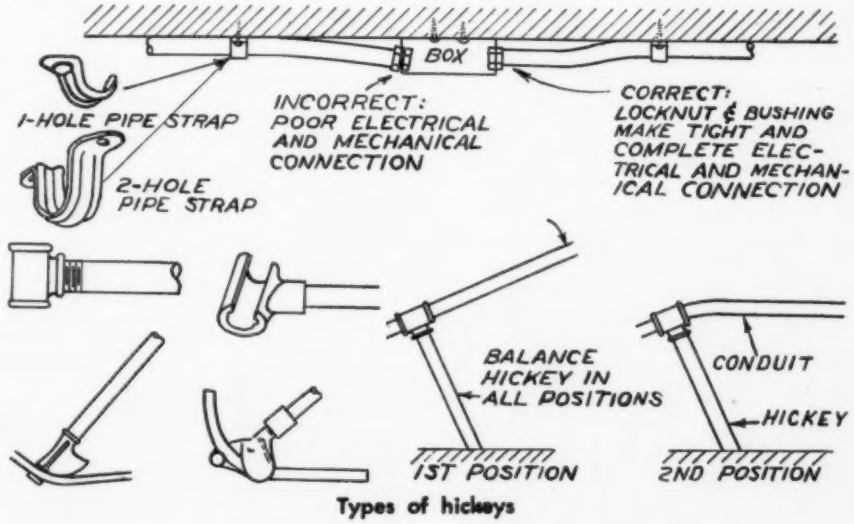
Object: To teach the uses of offsets in rigid conduit, the tools used and their manipulation. To provide practice in making offsets.

Information: Offsets are used on *surface wiring* where the level of the surface changes, and at each outlet box or other device where the conduit must be raised from the surface to enter the knockout hole. In *concealed work* it is used to clear obstructions or in some cases to enter flush boxes from the side. The sketch below shows the proper and improper way of "offsetting" to enter a box on the surface, or an exposed rigid conduit job.

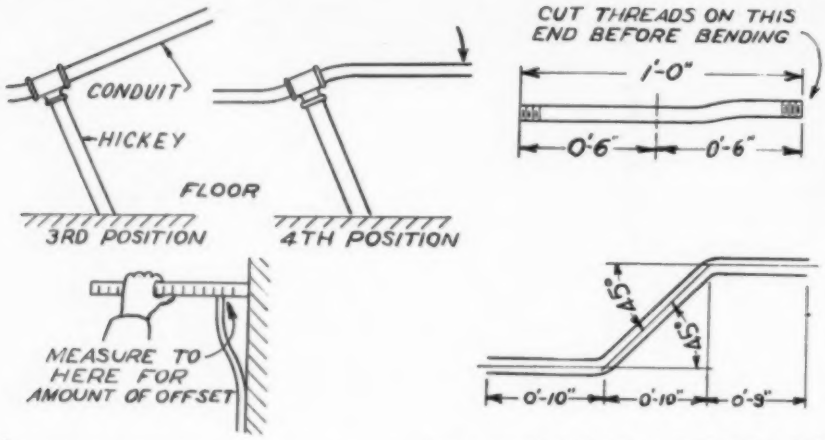
There are several types of hand tools for bending rigid conduit, and, in a general way, they are all termed "pipe hickeys." A few types are shown in the accompanying sketches. To make an offset, proceed as shown below.

In all positions, strike a *balance* with the hickey. This is a *one-man job*. Do not attempt to have a helper hold or try to balance hickey.

While an *offset is measured* by taking the distance between the center line of the main conduit and the center line of the offset, the best way to determine this distance is to place the conduit against a wall or other flat surface and measure out to the offset as shown in the drawing.



Types of hickeys



Job:

a) Make a 3/8-in. offset in a piece of 1/2-in. conduit as per sketch below. Cut a standard thread on each end of the conduit. This offset should be sufficient to enter an outlet box from surface run conduit.

b) Make an offset in a piece of 3/4-in. conduit near one end of a 1-ft. length. This offset is to be just enough to properly enter an outlet box from a surface line. This offset should be slightly less than that necessary in a 1/2-in. conduit used for the same purpose. Cut a standard thread on both ends of this piece. Remember, all conduit ends must be reamed.

Questions:

1. What is the smallest size (trade) of conduit ordinarily allowed?
2. If it were necessary to make 12 lengths of conduit as indicated by the adjoining sketch, how many standard lengths of rigid conduit would be required?

References: Croft's Conduit Wiring, N.E.C.

SOME FUNDAMENTALS OF SCHEDULING

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Educational Adviser
Training Division, Bureau of Naval Personnel
Washington, D. C.

From the start we should keep in mind that it is not desirable to lay down or to follow rigid rules of scheduling. Two schools, identical in mission and curriculum content would not necessarily have identical schedules. Such things as availability of equipment, classroom and shop facilities, instructor load, and the level of training must be taken into consideration. The fundamentals of scheduling should be used as guides in setting up a school program. Let us take up the problem of practical work first.

The term "practical work," as used in this article, includes all types of application, both mental and physical. The solving of mathematical problems is a form of practical work just as is the cutting of a screw thread on a lathe, although the two types are different in that one is primarily mental in nature and the other is both mental and physical.

Experienced instructors know that the rate of learning decreases rapidly when students are kept in a classroom in a listening situation for long periods of time. In thinking about instruction we need to apply the same common sense that we would in preparing food. We readily recognize that poorly prepared food is not worth serving. Regardless of how badly men need food it is useless to serve them unless the food is suitable to their needs. In extreme cases this will vary with the recent experiences of the men. For example, men who had had starvation diets in prison camps have to undergo a gradual change of diet before they can consume normal food in normal amounts again. Further, regardless of how good the food is, no one cares to continue to eat hour after hour. Even the best steak becomes uninteresting when we have had our fill of eating.

These same principles apply to instruction. In most cases it may be said that the point of diminishing returns on lecture-type instruction is reached after about the first 10 or 15 minutes. Little learning will take place after that unless provision is made for strengthening the learning by practical application, discussion, summary, questions, tests, ect. These periods of application or practical work should follow as closely as possible the more theoretical work to which they are related. Short periods of application in each period of the daily schedule are desirable. In any event, some practical work should be included in every day's plan.

A further illustration of how learning takes place can be illustrated by two ways of showing a film. If we take a 60-minute film, show it to a group of students, and then measure the amount they have learned, we will find they are able to remember only a relatively small part of what is contained in the film. This, of course, will depend somewhat on the type of film and on the background of the students. If, however, we show this same film, stopping it several times where natural divisions in the subject matter occur, and discuss what has already been seen, we will find that much more has been learned. The fact to remember is that long periods of concentrated instruction of one type such as lecture or demonstration do not pay dividends unless there is considerable variety in the presentation. Short periods of instruction followed by discussion and application will produce much better results and will in the long run pay dividends by turning out better graduates of the course.

Relationship of Theory to Application

There should always be a definite and planned relationship between theoretical work and practical work. Theory is necessary in order to provide more thorough understanding of the practical work and in order to provide information necessary for applying judgment as the practical situation changes. In scheduling, the relationship of theory to practice must always be considered. One is usually on sound ground when he teaches the theoretical parts of a job first, and follows this immediately with the practical work to which the theory is closely related. If one were to teach the characteristics of the hand saw (how to identify the crosscut from the rip, the sizes and types of teeth and what saws to use for various types of work) this would be taught prior to the actual practice in using the hand saw. While the theory must be taught prior to the practical work, it should be taught in small amounts and immediately preceding the application. It is not sound practice to teach a great deal of theory several days in advance of the time when students apply the theory in practical situations. To divide the theory instruction into small units which may be followed immediately by periods of practical work is recognized as sound procedure.

For example, such subjects as mathematics, principles of tool operation, and electrical theory should be taught over a considerable time in the schedule thus enabling each part of it to be more closely related to the practical work as it occurs in the course. It is wasteful of time and energy to teach all of the mathematics at the beginning of the course. Mathematics

(Continued on page 18A)

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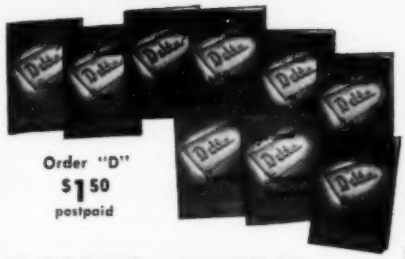

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SCHEDULING

(Continued from page 178)

should be spread throughout the course so that it may be applied to practical problems as it is learned. It is recognized that this increases scheduling difficulties and may affect teacher loads and the use of classroom and laboratory space. However, in general it will pay dividends to space the theory so that it is taught in relatively small amounts throughout the course.

Content Covered and Amount Learned

Another problem in scheduling is to decide whether to cover a great deal of material or to cover less material and provide for more discussions, questions, tests, and other forms of application. Since the primary mission of any school is to develop desirable attitudes and to teach information and mental and physical skills, the only accurate measure of the success of a course is its effect on the students following their graduation. We cannot measure the value of a school by the amount of content in the curriculum. We can only measure its effectiveness in terms of desirable changes in the students. Curriculum builders are frequently under pressure to include the maximum amount of content in each hour of the schedule. The time allowed in the schedule for putting this newly acquired knowledge into practice and thereby strengthening the learning by doing is frequently challenged by those who wish to expose the students to a great amount of material in a short time. Perhaps there is no entirely satisfactory solution to this problem; however, we should give consideration to the fact that students may actually learn more if less material is covered. Schedules crowded with lectures and demonstrations often result in little learning if no time is allowed to digest the material and to apply it.

The first practical step to take in trying to solve this difficult problem is to analyze the content very carefully and attempt to eliminate nonessential material and to decrease the time spent on minor points in order to allow time for summary, review, and drill on the essential points.

Transfer of Training

We must be careful not to include material in the daily schedule merely because it is nice to know. Occasionally we find material included in courses of study because of custom, or it may be argued that some material is included because it helps to train or discipline the mind. This theory does not stand up very well under analysis. Training in one subject does not necessarily increase one's ability in another subject. It may, however, if the two subjects are similar. Certainly, training in mathematics would help one to learn the theory of electricity, not because of the mental discipline involved, but because mathematics is part of electricity. There are common elements in many trades and these will transfer from one subject to another. It has been proved, however, that the study of a subject entirely unrelated to another subject, even though the first subject may be extremely difficult, does not necessarily help one to learn the second subject. One does not learn typing more easily because he knows history. On the other hand one will learn typing more easily if he knows how to spell because he needs to know how to spell in performing the job of typing. A machinist could be taught carpentry more easily than bookkeeping because more elements such as the principles of geometry and physics as well as skill in using certain tools are common elements in machinist work and in carpentry.

Transfer of some attitudes of mind such as the habit of concentration may occur, and it is true that the student who has studious habits is likely to apply these habits to any subject he undertakes to learn. *However, this desirable attitude*

(Continued on next page)

SCHEDULING

(Continued from previous page)

comes more from such things as good instructor-student relationships than from study of any specific subject.

We are more likely to study a subject thoroughly if we know it will be of value to us in doing what we have to or want to do. Every item of subject matter in a schedule should be challenged on the basis of whether or not a man needs to know it in order to do the job for which he is in training. No subject should be justified on the basis of mental discipline alone. Very little curriculum content can be justified on the basis of its assisting one in learning some other subject.

Breaks and Rest Periods

Occasionally two or more periods are combined into a longer period by eliminating the normal break between periods. This, it is argued, makes it possible to dismiss classes earlier in the day and provides for greater leisure time away from the school. It should be remembered that the breaks between periods have a definite training significance and that more will be learned, digested, and retained if these breaks are worked into the schedule at the end of each normal period of from 45 to 60 minutes. It may be argued that there is lost time resulting from the more frequent stopping and starting of classes when a number of breaks are scheduled. This may be true if a great deal of equipment has to be put away at the close of each period and reissued at the beginning of the

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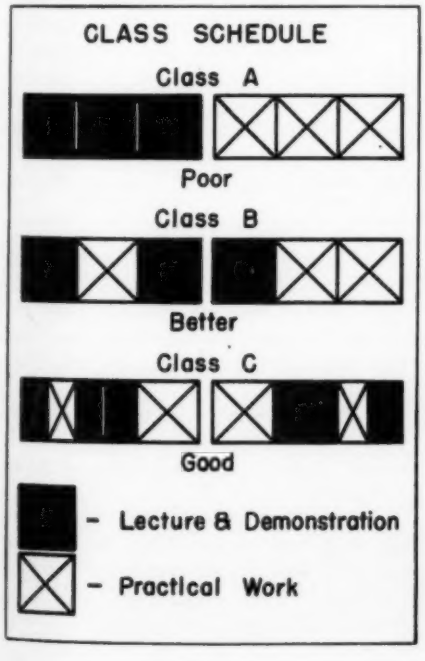

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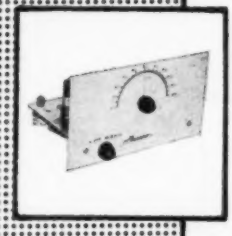

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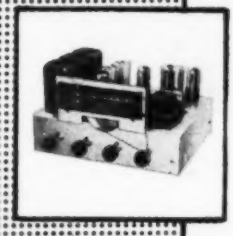

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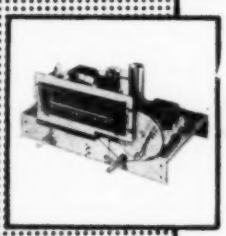

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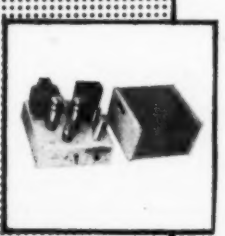

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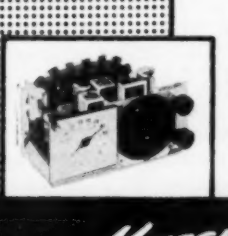

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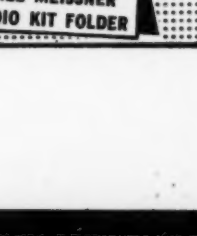

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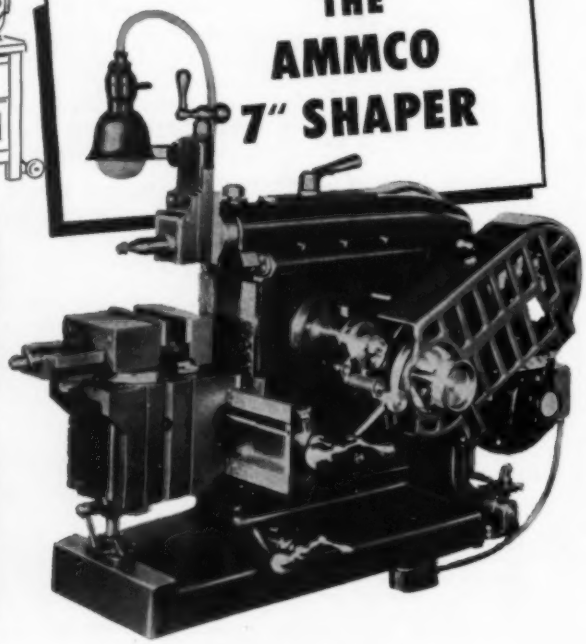

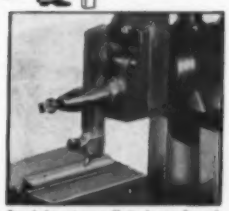

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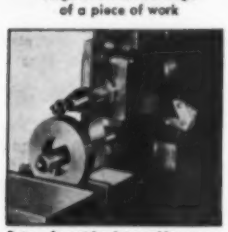

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SCHEDULING

(Continued from previous page)

next period. However, in the more typical classes there should be almost no loss of time in reorganizing the class after a break. If there is loss of time it probably indicates that the instructor is at fault, and that he has not prepared his lesson well enough to catch the interest of the class and maintain discipline from the start.

Excessive Work Schedule

Excessive hours of work are wasteful of human energy and do not increase production. In some industries for example, workers have created more in a seven- or eight-hour day than they did in a nine- or ten-hour day. It is doubtful whether or not we should ask anyone in any school to concentrate on new subject matter for more than six hours per day, exclusive of individual study. In addition, longer work days are likely to set up significant morale problems. Exceptions to this occur under unusual circumstances. With the stimulus provided by wartime conditions it was possible in many instances to increase the school day, over short periods of time, without decreasing efficiency. However, the long range programs did not bear this out. Further, some types of subject matter, particularly those involving a considerable amount of practical work with tools and materials, lend themselves to longer periods of instruction.

Time of Day and Learning

Some consideration should be given while scheduling to the fact that learning is accomplished more easily at certain times of the day than at others. This will vary with the individual, for some people work better late at night while others do their best work early in the morning. In general, however, we can assume that the best results will be obtained if we schedule the most difficult work during the morning hours and the most interesting work during the afternoon hours. The period just after the noon meal is not the most satisfactory period for the showing of films or for lecturing. Wherever it is necessary to schedule a lecture or film just following the noon meal every effort should be made to make the introduction interesting and to provide for some type of student participation such as discussion to act as a stimulant.

The Minimum Work Week

Students attending six hours of instruction per day will tend to become tired and will need to be provided with as interesting a schedule as possible. Every effort should be made to put variety in the schedule and to keep the instruction moving along at an interesting pace, making maximum use of training aids and student participation. In schools where a degree of skill is required of the graduates, additional time for learning these manual skills may be required. Further, it is assumed that in highly theoretical or technical courses into which selected trainees are sent, additional time should be used by the students for individual study, problem solving, and practical application of theory.

To summarize:

1. Include some practical work in each day's schedule. Practical work is not necessarily that of working with tools and materials. Problem solving, discussions, and tests help to provide variety and strengthen learning.

2. Teach theory in small amounts just preceding the practical work to which it is related. Don't teach large blocks of theory at one time.

3. Keep lectures and talks short. Learning drops off rapidly after the first few minutes. Provide for questions and discussions.

(Continued on next page)

SCHEDULING

(Continued from previous page)

4. Cut down nonessential material in order to allow time for review, discussion, and application on the important things.

5. Don't teach material for reasons of mental discipline. The value of all material in the curriculum should be easily justified on the basis of its future use in a real situation.

6. Allow breaks between periods, for relaxation and time to digest instruction. Well-scheduled breaks increase the amount learned.

7. Keep the instructional day at a reasonable length. Provide for individual study.

8. Schedule the most difficult work in the morning and the most interesting work in the afternoon. Avoid scheduling lectures and films at periods of the day when students are likely to be sleepy or tired.

9. Provide for maximum variety in teaching through the use of a number of teaching methods, well-planned practical work, and well-selected training aids.

Personal News

♦ Students receiving the B.S. and M.S. degree during 1949 in industrial education from the Texas A. & M. College, College Station, Tex., have been placed as follows:

Master of Education: George V. Radcliffe, Instr. of Ind. Ed., Memphis State College, Memphis, Tenn.; Joseph M. Branom, Instr. of Ind. Arts, Southwestern State Teachers College, San Marcos, Tex.; John O. Evans, Instr. of Ind. Arts, East Central Jr. College, Decatur, Miss.; Jay F. Holt, Tchr. Mech. & Arch. Drwg., H. S., Kansas City, Kans.; James Y. Jeter, Instr. of Ind. Arts, Paris Jr. College, Paris, Tex.; Harold R. Brenholz, Auto Mech. Instr., DelMar College, Corpus Christi, Tex.; Gordon E. Kerr, Woodwork Instr., Austin H. S., El Paso, Tex.; Jack N. Kraras, Director, Voc. Ed., Pine Bluff Schls., Pine Bluff, Ark.; John W. Page, Jr., Instr. Ind. Arts, H. S., Ysleta, Tex.; Jack K. Pound, Instr. Ind. Arts, Pasadena, H. S., Pasadena, Tex.; Marshall A. Storey, Instr. Ind. Arts, H. S., Port Isabel, Tex.; W. A. Mayfield, Instr. Ind. Arts, Palestine, Tex.; Charles W. Stimson, Personnel & Safety Dirc., SW Pub. Service, Plainview, Tex.

Bachelor of Science: J. D. Chaney, Ind. Arts. Tchr., Vivian H. S., Vivian, La.; Tommy Lee Evans, D. O. Co-ordinator, H. S., Kingsville, Tex.; Albert Martin, Ind. Arts Tchr., Pub. Schls., El Paso, Tex.; Anton M. Sevcik, Ind. Arts Tchr., H. S., Port Lavaca, Tex.; Paul H. Wallenfelt, Ind. Arts Tchr., H. S., El Campo, Tex.; B. A. Wyatt, Jr., Voc. School, Brownwood, Tex.; C. J. Cervenka, Woodwork Instr., Jones Co. Jr. College, Ellisville, Miss.; Jack R. Donnell, Mech. Drwg. Tchr., H. S., Pasadena, Tex.; James M. Green, (PT) DelMar College, Corpus Christi, Tex.; Monroe C. Neff, Tchr. in Jr. H. S., Jackson, Miss.; Stephen D. Pearce, Instr., SW Tech. Schl., Bryan, Tex.; W. W. Pendergrass, Tchr. Ind. Arts, Vivian H. S., Vivian, La.; C. A. Gibson, Designer, Mosher Steel Co., Dallas, Tex.; Joseph A. Kavanaugh, Main Eng., Jefferson

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PERSONAL NEWS

(Continued from previous page)

Chem. Co., Port Neches, Tex.; George B. Palmos, Training Dept., SPRR, Hearne, Tex.; James F. Thurmond, U. S. Army, New York; Wm. T. H. Utz, Jr., Humble Oil & Refining Co., Tyler, Tex.; Wm. E. Wolff, DuPont Co., Victoria, Tex.; James M. Green, U. S. Naval Base, Corpus Christi, Tex.; Robert E. Odell, Safety Engr., Hartford Fire & Accident, Tulsa, Okla.; Gilbert R. Reinarz, Agent, Amicable Ins. Co., New Braunfels, Tex.; R. A. Speed, Boy's Counselor, Salesmanship Club, Dallas, Tex.; George W. Bowling, Tchr. Ind. Arts, Hinds Jr. College, Raymond, Miss.; Raymond B. Havlik, Tchr. Ind. Arts, H. S., Bryan, Tex.; Leon O. Seeman, Instr., SW Tech. Schl., Bryan, Tex.; Vance G. Denton, Tchr. Gen. Metals, H. S., Port Arthur, Tex.; Johnnie Zabcik, Navarro Jr. College, Corsicana, Tex.; A. J. Marshall, Navarro Jr. College, Corsicana, Tex.; Donald W. Cole, Wind Tunnel, A. & M. College, College Station, Tex.; J. B. Denney, Safety Eng., United States Fidelity & Guaranty Co., Tulsa, Okla.; C. L. Maddox, Salesman, Dallas, Tex., Binswanger & Co.; John I. Hammonds, Auditor, United States Fidelity & Guaranty Co., Tulsa, Okla.; John F. Marino, Tex. Highway Dept., Bryan, Tex.; C. M. Morris, Safety Eng., United States Fidelity & Guaranty Co., New Orleans, La.; Harry J. Stone, Safety Eng., United States Fidelity & Guaranty Co., Oklahoma City, Okla.

♦ NELSON L. BURBANK has been made chairman of the fund raising committee for the Fred C. Whitcomb Memorial Scholarship in industrial-arts education at Miami University, Oxford, Ohio. His address is 5735 Winthrop Ave., Cincinnati 24, Ohio.

♦ STANLEY F. SCHOLES has been appointed part-time local supervisor of trade extension training at Twin Falls, Idaho. Mr. Scholes will be responsible for the operation of the trade extension program in Twin Falls. These supervisory duties are in addition to his regular duties as instructor of the Twin Falls apprentice plumbing class, which meets two evenings per week.

♦ HOLLIS H. DAHLER, director of vocational education, Kansas City, Mo., will be a member of the staff of the industrial education department of Northwestern State College, Natchitoches, La., for the 1950 summer school session.

♦ J. HENRY CHAPPELL was recently named to succeed G. H. Russell as director of vocational, industrial, and adult education in the Fort Wayne, Ind., city schools.

His experience in the field of industrial education includes teaching industrial arts in the elementary grades, drafting at South Side and Central High Schools, and more recently industrial co-ordinator.

He holds a B.S. degree from Ball State Teachers College, the M.S. degree from Indiana University, and has taken graduate work at Purdue University.

♦ MICHAEL PEKNIK has been appointed supervising instructor at the Empire Trade School, New York City.

Mr. Peknik will specialize in the teaching of fitting and alterations of clothing, during the school's evening sessions.

♦ PROF. CARL SHIPP MARVEL, head of the department of organic chemistry at the University of Illinois, has been awarded the Willard Gibbs medal for his wartime work in developing the synthetic rubber program.

The medal, one of the highest honors in American science, will be presented at a dinner May 19. It is conferred annually by the Chicago section to an outstanding chemist chosen by a national jury.

♦ A. T. DUNHAM, industrial-arts teacher at University City High School, St. Louis, Mo., for 26 years, died on February 27 after a long illness.

♦ RICHARD JAMES TREZONE, Minneapolis, Minn.; ROBERT ROYCE LYNCH, Green Bay, Wis.; EDWARD W. FLAYER, Buffalo, N. Y.; and ROY HERMAN MITTELSTADT, Roberts, Wis., finished the requirements of the M.S. degree on January 20, at The Stout Institute, Menomonie, Wis. The diplomas will be awarded to these men at the annual college commencement on June 2.

♦ DARRELL MATHAS, who was graduated in 1949, is beginning his professional career as a teacher of industrial arts and physical education at Bellmore, Ind.

♦ MAX STALCUP, Atchison, Kans., has been appointed director of the program of adult education. He succeeds Armin Soph, assistant principal, who will now be able to give additional time to his supervisory and guidance duties in the high school. Mr. Stalcup is co-ordinator of the part-time occupational education in office practice.

♦ WILLIAM MALE, formerly an industrial-arts teacher in the Washington Irving Junior High School, Schenectady, N. Y., has been appointed director of vocational education in Gloversville, N. Y. Mr. Male has also taught some of the industrial teacher training courses in the Albany area the past few years.

♦ W. W. BEERS, formerly deputy superintendent for vocational education, Territory of Hawaii, has retired because of ill health.

♦ WILLIAM H. COULTER, formerly supervisor of agriculture education, has been appointed deputy superintendent for vocational education, Territory of Hawaii.

♦ DR. GORDON O. WILBER, national president of the Epsilon Pi Tau Fraternity, and director of the industrial-arts department at the State Teachers College, Oswego, N. Y., has finished his tour of visits to teacher-training institutions and is again hard at work on his job at Oswego.

♦ DR. FRANK G. DICKEY, who since the death of Dr. William S. Taylor last August, has served as acting dean of the University of Kentucky

(Continued on page 23A)

PERSONAL NEWS

(Continued from previous page)

College of Education, has been appointed dean of the College by the University's Board of Trustees. The appointment became effective January 1.

The new education dean, only 32 years old, thus becomes one of the youngest college deans in the United States.

Dr. Dickey attended the Lexington, Ky., public schools and was graduated from Henry Clay High School in 1935. After receiving his bachelor of arts degree from Transylvania College in 1939, he entered the University of Kentucky Graduate School and in 1942 was awarded the degree of master of arts.

Though his work toward a doctorate degree was interrupted by two and one-half years' army service during World War II, the new University of Kentucky dean completed the academic requirements in 1947 after his return from military duty and was awarded the doctor of education degree at the University's 1947 commencement.

Dr. Dickey has taught in both the Fayette County and Lexington city school systems, and has served as instructor, assistant professor, and associate professor of education at the University of Kentucky.

Association News

♦ The fourth annual Louisiana Industrial Education Conference will be held on the Northwestern State College Campus, Natchitoches, La., April 21–22. With the theme, "Expanding Industrial Education in Louisiana," the conference will deal with instructional and industrial problems that occur in the fields of building trades, auto mechanics, electricity, radio, refrigeration, machine shop, and industrial arts. In addition, three general sessions with programs of interest in the field of industrial education have been planned for the conference.

Specialists in the field of industrial education who will participate in the conference, include: Dr. A. B. Mays, University of Illinois; James R. D. Eddy, University of Texas; Jack Gamble, director of Vocational Education for Louisiana; Theodore Perrier, architect, New Orleans, La.; Horace Rickey, general contractor, Lafayette, La.; Robbin M. Hood, manager, Shreveport Refrigeration Company; Joe Mooney, lighting consultant, Louisiana Power and Light Company; George L. Cunningham, machine-shop instructor, Delgado Central Trades School, New Orleans, La.; W. C. Willhite, Ouachita Valley Vocational School, Monroe, La.; W. H. McDonald, Southwest Louisiana Trade School, Crowley, La.; H. F. Hays, acting director, Louisiana State Trade School Curriculum Laboratory; Dr. Nelson A. Hauer, head, Industrial Education Department, Louisiana State University; H. O. Thomas, state supervisor, Industrial Arts Education for Louisiana; L. A. Braud, director, Avoyelles Trade School; F. O. Seymour, Ouachita Valley Vocational Trade School; James W. Gaspard, Southwest Louisiana Trade School, Crowley; H. E. Givens, Department of Vocational Education, Little Rock, Ark.; Henry McTyre, acting director of the Natchitoches Trade School.

♦ The National Vocational Agricultural Teachers Association has elected the following officers for 1950: president, Parker Woodul, Portales, N. Mex.; vice-presidents, Region I, Leroy Bummel, Tremonton, Utah; Region II, J. L. Harvey, Loveland, Colo.; Region III, Neil Johnston, Clarinda, Iowa; Region IV, Maxwell Lampo, Neosho, Mo.; Region V, A. C. Hale, Camden, Ark.; and Region VI, C. W. Seabold, Reisterstown, Md.

♦ Iota Lambda Sigma elected the following officers for 1950: president, Glenn Smith, Oklahoma A. & M. College, Stillwater, Okla.; vice-president, George F. Henry, Colorado A. & M. College, Fort Collins, Colo.; historian, George H. Resides, Pennsylvania State College, State College, Pa.; secretary-treasurer, Clyde H. Wilson, University of Tennessee, Knoxville, Tenn.

♦ The American Association of Technical High Schools and Institutes have elected the following officers for 1950: president, George H. Parkes; vice-president, J. E. Hollingworth; and secretary-treasurer, Richard W. Howes.

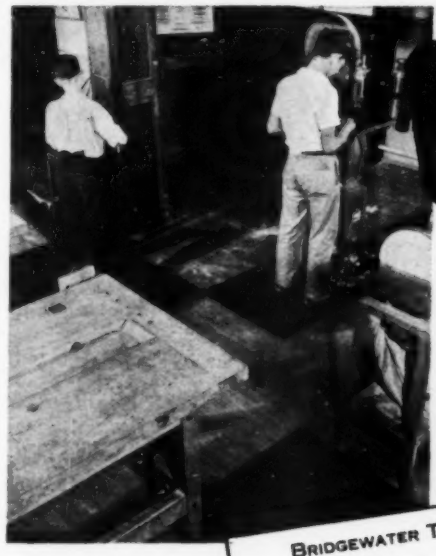
♦ The January meeting of the Central Connecticut Industrial Arts Association learned of the many problems that elementary school teachers have to overcome in order to carry on the simplest form of industrial-arts work. Among their major problems are two: (1) Where and how to get tools and supplies? (2) Where can they seek advice on their projects?

At the March meeting, held at the New Webster Hill School in West Hartford, Conn., G. Wesley Ketcham, Connecticut state supervisor of industrial arts, spoke on "Implementing Industrial-Arts Programs on All Levels." In his talk he covered the elementary, junior high, senior high schools, and the adult programs. The major points of emphasis included (1) Program and Plant Planning; (2) Equipment and Tool Needs; (3) Program Implementation Through Activity and Related Information.

The annual spring two-day convention of the Connecticut Industrial Arts Association at Teachers College of Connecticut, New Britain, will be held on Friday and Saturday, March 24 and 25. There will be commercial exhibits, and the theme will be "Shop Layouts and Equipment." Leroy Bollinger is to be the guest speaker. — *John B. Fuller.*

♦ The Idaho state board for vocational education met in Boise on January 14, and approved 21 new trade extension courses, and a program of distributive education at North Idaho Junior

(Continued on next page)



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ASSOCIATION NEWS

(Continued from previous page)

College in Couer d' Alene. It also approved four new farm training programs for veterans and new farm shop programs in 27 different Idaho communities for veterans in the on-the-farm training program operated in co-operation with the Veterans Administration.

♦ December 14, 1949, saw a very impressive initiation of 22 new members into Mu Chapter of Iota Lambda Sigma, at Purdue University, Lafayette, Ind. Those initiated were as follows:

Students — Geo. Robert Botts, Robert Elmer Boyer, E. Harper Campbell, J. Herbert Cokain, F. Perry Dawson, Wm. Crawford Dingwall, B. Robert Frazin, J. Lee Gabriel, Jesse E. Gerber, Jr., Wm. Melvin Harrison, Jr., K. Robert Leffler, Carl P. McClure, Roger A. Schoonaert, Paul D. Schuyler, W. D. Sheppelman, Henry R. Simmons, and Irwin A. Trask, (graduate). Field man — Aaron Adams, drafting instructor, Marion, Ind.

♦ Panel sessions, demonstrations, and luncheon meetings will be features of the annual Spring Conference of the Industrial Arts Department of Vocational Education at New York University's School of Education, which will be held on April 28 and 29.

Two panel sessions, the first on "How to Use the Evaluation Program to Make Industrial Arts More Effective in the School," and the other on "The Implications of the Evaluation Program for the Industrial Arts Teachers."

An arts and crafts exhibit will be held Friday, from four to eight in the evening, and leading companies on Saturday morning will exhibit and demonstrate industrial-arts products.

The conference will end Saturday, with a luncheon meeting at the University Faculty Club, 22 Washington Square North, New York 3, N. Y. For further information contact N. Cherkezian, at the address given.

♦ The Nebraska Industrial Education Association meeting will be held at the State Teachers College in Kearney, Neb., on April 15, 1950.

The principal speaker will be Dr. Clarence T. Baab from the industrial arts department of the Colorado College of Education at Greeley, Colo.

Officers of the association are: president, R. A. Schreiner, chairman of practical arts division, State Teachers College, Wayne, Neb.; secretary, Martin Bausch, head, industrial arts department, Superior High School, Superior, Neb. — *R. A. Schreiner.*

♦ The Industrial Arts Society of State Teachers College, Millersville, Pa., has just completed its semester's registration of new members. The society, which was formed in 1932, has 140 active members. Dr. Burl N. Osburn is the faculty adviser to the group. The officers are: president, Melvin Hunter; vice-president, C. W. Lubbe; secretary, Fred Starr; treasurer, Elwood Kramer; program director, Frank Prescott.

♦ Plans for the 1950 Indiana Industrial Education Association Convention have been announced by Gordon Johnson, president of the Indiana Industrial Education Association.

The meeting will be held at Turkey Run State Park Inn on April 27, 28, and 29.

Efforts are being made to urge more schools to participate in the school exhibits at this convention.

News Notes

♦ The Children's Village High School is making available to teachers two of its publications: *A guidance Primer* and *Find Your Vocation.* The book lists qualifications necessary for success and happiness in 160 vocations, trades, and professions. There is no charge for this material except 25 cents for handling. The books will be sent postpaid upon receipt of the handling fee to Ernst H. Suerken, supervising principal, Union Free School District, Greenburgh No. 11, Dobbs Ferry, N. Y.

♦ Adult evening classes in potterymaking will be offered Monday, Tuesday, and Thursday evenings at Montgomery Blair High School, Silver Spring, Md., from 7:00 p.m. to 10:00 p.m. Wednesday classes will be held at 7:00 p.m. at the Leland Junior High School, Chevy Chase, Md.

♦ A graduate fellowship in chemical engineering at Illinois Institute of Technology has been established by the Federation of Paint and Varnish Production Clubs.

The fellowship leads to a doctor of philosophy degree in chemical engineering and includes a grant of $1,350 and $660 tuition for two semesters and a summer session.

Applications should be sent to the dean of the graduate school, Illinois Institute of Technology, Chicago 16, before July 1, 1950.

♦ Federal training for veterans still is moving ahead at close to top speed, four and one-half years after the end of World War II.

Following are some of the statistics:

The total of 2,474,000 veterans in training under the G.I. Bill and Public Law 16 at the end of 1949 was only 2 per cent below the number enrolled a year ago, and 12 per cent under the all-time peak at the end of 1947.

One million veterans started training for the first time under the two laws during 1949 — a 20 per cent drop from the 1,250,000 who entered initially during 1948.

The 2,474,000 veterans enrolled under the two laws on December 31, 1949, compares with 2,533,000 in training on December 31, 1948, and 2,802,000 on December 31, 1947.

♦ Johnny Clive Williams, a farm boy from Fayette, Ala., is being hailed as a 16-year-old combination of Burbank, Bromfield, and Edison. His achievements in putting electricity to work on the farm have won him a Westinghouse

scholarship award as one of six national winners in the 4-H Better Methods Electric Contest sponsored by the Westinghouse Educational Foundation, which is maintained by the Westinghouse Electric Corporation.

♦ A workshop on the school plant will be offered at Cornell University during the 1950 summer session July 3 to August 12. It is intended for school officials who are faced with the problem of planning a school building. Problems to be considered include surveying building needs, estimating probable enrollment, determining the number and kinds of rooms, and appraisal of plans and administrative procedures.

For further information write to Professor J. E. Butterworth, Stone Hall, Ithaca, N. Y.

♦ The annual report on apprentice and occupational extension training in New York State during the past school year showed 35 new centers conducting programs. A total of 102 communities conducted 834 classes for 20,129 apprentices and 71 communities enrolled 22,496 persons in 692 occupational extension classes. With only about 85 per cent of the industrial classes for adults reporting, there were 408 centers with an enrollment of 26,472 persons in 1283 classes. This represents a large increase over 1945, when there were only 29 centers having 1200 enrolled in apprentice classes and 9146 enrolled in occupational extension classes.

♦ Purdue University, Lafayette, Ind., is offering specialized training in problems pertaining to school business management in such courses as estimating school building materials and cost of construction, school building maintenance and operations, principles of school accounting and budgeting, and heating and air conditioning. Students taking this course will be prepared to meet the requirements for teaching industrial-education subjects. Those who complete the course will earn the B.S. degree in trade and industrial education.

Opportunity for enrolling is offered with the opening of the second semester of the 1949–50 school year.

♦ "Welding and Cutting Fumes," and "Health and the Welder" is a 13-page reprint of three outstanding articles published by The Welding Engineer to answer authoritatively common questions on health hazards in welding. The articles are illustrated, and contain a complete bibliography on the subject.

The reprints are available from The Lincoln Electric Company, Cleveland 1, Ohio, at 25 cents.

♦ A 16-page illustrated instruction book on metal spinning has been published by Boice-Crane Company, 932 Central Avenue, Toledo 6, Ohio, and is being offered free to instructors.

Various methods are described for producing an endless variety of beautiful forms. Lathes, one-piece and sectional chucks, spinning tools, metals, lubricants, blanks, and back sticks are described in detail. The book is of the "how to" variety and is written for easy understanding by the beginner.

♦ "Conservation is Everybody's Business," a new kit of Teach-O-Filmstrips, has just been released by Popular Science Publishing Co., 353 Fourth Ave., New York 10, N. Y., in answer to the call of the N.E.A. and other educational organizations for more teaching of conservation. Produced in co-operation with World Book Encyclopedia, the new series has been made with the help of educational consultants from the Soil Conservation and Forest Services of the U. S. Department of Agriculture.

Designed for Social Studies and General Science classes of seventh, eighth, and ninth grades, the series consists of four film strips, each over 50 frames in length, and all in full, natural color.

"Conservation is Everybody's Business" is offered as a complete kit, containing, in addition to the four full-color strips, a fully illustrated teaching guide and a hard-cover, book-style file box.

For further information address Popular Science, Audio-Visual Division, 353 Fourth Ave., New York 10, N. Y.

♦ A course in "Industrial and Technical Education on the Post-Secondary Level" will be given for the first time this summer by the New York State School of Industrial and Labor Relations at Cornell University for all persons interested in post-high school and industrial and technical education.

This course is one of eight to be given in the field of industrial education during the forthcoming summer session. The session will begin July 3 and continue through August 12.

Information concerning these courses may be obtained by writing to the New York State School of Industrial and Labor Relations, Cornell University, Ithaca, N. Y.

♦ Applications for the competition for fellowships in the fourth national Silversmithing Workshop Conference for art teachers and supervisors which Handy and Harman organize and sponsor each summer, are available by writing the Craft Service Department, Handy and Harman, 82 Fulton Street, New York 7. The deadline for entries is April 1. The conference will be held this year at the School for American Craftsmen, which is now a part of the Institute of Technology in Rochester, N. Y.

♦ An introduction to planning, writing, and producing educational radio programs will be offered summer school students at Cornell University during the 1950 session July 3 to August 12. The course, "Radio in Education," will consist of lectures, studio seminars, and laboratory work.

♦ Rider Manual Volume XX, the latest volume in the Perpetual Trouble Shooter series, is currently available at all Rider distributors, and from John F. Rider Publisher, Inc., 480 Canal Street, New York 13, N. Y.

The coverage on AM-FM receivers, auto radios, record changers, and tuners is complete as of November, 1949. Factory-authorized data of 74 manufacturers comprises 1776 pages — all filed in their proper places. A cumulative index for Volumes XVI through XX plus a "How It Works" book (simplified discussion of the latest circuit theory) rounds out the coverage.

♦ A 36-member National Advisory Committee was announced recently by Ford Motor Company to assist in developing its program of

(Continued on next page)

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HEAVY DUTY 12" x 4" THICKNESS PLANER
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The only shaper having ⅛" and ¾" cutting arbors formed on a solid one-piece spindle. Stronger. Truer running. Safer. Runs wide mouldings and raised panels in one cut.
SPINDLE SANDER
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Self-adjusting friction roll drive. Peripheral speed remains constant as wheel wears. No water thrown on operator. Larger adjustable tool rest, mounted above grindstone for comfortable operating position and control of pressure.
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NEWS NOTES

(Continued from previous page)

industrial-arts awards for junior and senior high school students enrolled in shop and drawing courses.

The present committee is composed almost entirely of men who served in a similar capacity when the program was conducted by Scholastic Magazines. The membership now represents 28 states but will be extended to include representatives from every state.

Committee members will be asked to advise the company and its consultant, George H. Fern, on the drafting of rules and regulations, selection of judges and other matters concerning the program. Company officials said that they were particularly pleased with the enthusiastic response of leaders in the field who had been asked to serve to date.

Names of Advisory Committee members follow: Dewey F. Barich, Kent State University, Kent, Ohio. Earl L. Bedell, Board of Education, Detroit, Mich. Hartwig O. Bjerg, Arizona State College, Flagstaff, Ariz. Clyde A. Bowman, Stout Institute, Menomonie, Wis. Kenneth W. Brown, Board of Education, Philadelphia, Pa. Robert A. Campbell, New Jersey Department of Education, Trenton, N. J. S. L. Coover, State Teachers College, California, Pa. Thomas Diamond, University of Michigan, Ann Arbor, Mich. Roy G. Fales, New York State Education Department, Albany, N. Y. Chris. H. Groneman, A. & M. College of Texas, College Station, Tex. James J. Hammond, State Teachers College, Fitchburg, Mass. O. A. Hankammer, Kansas State Teachers College, Pittsburg, Kans. O. S. Harrison, University of Georgia, Athens, Ga. George F. Henry, Colorado A & M College, Fort Collins, Colo. Ivan Hostetler, University of North Carolina, Raleigh, N. C. DeWitt Hunt, A & M College of Oklahoma, Stillwater, Okla. H. M. James, Maryland State Department of Education, Baltimore, Md. Doyle Kemper, Southwest Missouri State College, Springfield, Mo. G. Wesley Ketcham, Connecticut State Department of Education, Hartford, Conn. John R. Ludington, U. S. Office of Education, Washington, D. C. Frank C. Moore, Board of Education, Cleveland, Ohio. S. D. Mullikin, Henry Ford Trade School, Dearborn, Mich. John E. Nelson, Vermont Department of Education, Montpelier, Vt. Louis V. Newkirk, Board of Education, Chicago, Ill. Otto C. Olsen, Nebraska State Teachers College, Kearney, Neb. V. L. Pickens, Public Schools, Kansas City, Mo. Roy A. Radtke, Board of Education, Chicago, Ill. Charles M. Rice, Western Washington College of Education, Bellingham, Wash. Dale Roberts, High School, Mattoon, Ill. Fred J. Schmidt, Jr., Ball State Teachers College, Muncie, Ind. William E. Sloane, Henry Barnard School, Rhode Island College of Education. H. A. Sotzin, San Jose State College, San Jose, Calif. H. O. Thomas, Louisiana State Department of Education, Baton Rouge, La. Maurice C. Varney, Maine State Department of Education, Augusta, Me. H. T. Widdowson, University of Minnesota, Minneapolis, Minn. Walter R. Williams, Jr., University of Florida, Gainesville, Fla.

♦ Students and administrative officials of Illinois Institute of Technology are working together in a new approach to obtain the best employment possibilities for graduates.

Under the supervision of Harold L. Minkler, director of placement, three-man teams of senior students visit medium and small industries in the Chicago metropolitan area to point out qualifications of forthcoming graduates.

Make-up of the team depends on the nature of the concern. In the case of an electrical manufacturing company, a prospective electrical engineer, mechanical engineer, and industrial engineer would call.

They acquaint the personnel manager with the college and its aims, the curriculum, and the areas covered in their courses.

Students are selected and made available by the Inter-professional Council, a student organization, and offer their services without charge. Each of the teams calls on an average of ten companies during their final semester.

♦ The American Gas Association, 420 Lexington Ave., New York City, has announced the release of *Flame Facts About Gas*, the second in a series of film strips with study guide, designed especially for school use.

The film strip presents a simple, step-by-step explanation of gas burner construction and shows how the layman should care for and adjust the burners in his home to obtain the most economical use of gas.

Prints of *Flame Facts About Gas* are available to teachers in some areas through their local gas companies or may be obtained at the address given.

♦ Three 4-year scholarships in chemical engineering at Illinois Institute of Technology will be offered by the Consolidated Natural Gas Systems Educational Foundation of Cleveland, Ohio.

The scholarships, beginning in September, 1950, emphasize gas engineering and technology in the fourth year, with special courses at the Institute of Gas Technology on the Illinois Tech Campus. The scholarships include full tuition, fees, and books.

Winners will be determined by high school records, extracurricular activities, and scholarship demonstrated in a written examination. Applications must be sent to the director of admissions of Illinois Tech by May 13.

♦ Howard B. Gundersen resigned as president of the Salt Lake Area Vocational School, Utah, to accept the position of supervisor of training in the Utah Copper Company's division of the Kennecott Copper Company.

Mr. Gundersen will develop supervisory, apprentice, and personnel training programs for the firm.

RECREATION
(Hobbies)

When the chores of the day are completed
And our labor for living is done,
We turn to our favorite hobby
And start doing something for fun.

It may be we practice the cello,
Or study the stars in the sky,
Or try our hand writing a poem,
Or even try learning to fly.

We paint or we golf or we garden,
Make collections of insects or stamps;
We may work in an amateur workshop
Making models or books ends or lamps.

If we suffer from nervous exhaustion
Through high-pressure business demands,
We cannot find better diversion
Than doing some work with our hands.

If we're sick of monotonous motions
Involved in an industry's grind,
We can strengthen our spirit's existence
By artistic expression of mind.

Divine aspirations and longings,
Submerged by necessity's drive,
May rise from the depths of depression
And prove that we still are alive.

— *Lindley H. Bennett,*
Toronto, Ontario, Canada.

There is much to say for humility. Our most precious gifts come to us, not when we are aggressive, but when we are merely receptive. The Chinese have a saying that runs like this: "The sea, by lying low, receives all the waters of the world." — *The Ranken News.*

Pupil-teacher planning does not eliminate the teacher. It is an easier way to teach only to the extent that a happy class makes a more pleasant teaching job. — *From Teaching Progress, Milwaukee Public Schools.*

There were about twice as many urban pedestrian deaths as rural — 6200 compared with 3650 — but there were more than four times as many rural nonpedestrian motor vehicle deaths as urban — 17,850 compared with 4300.

Deaths to workers from all accident causes in 1948 totaled 48,000 — 16,500 on the job and 31,500 off the job. Injuries were about 4,550,000. Total time lost was about 410,000,000 man days, equivalent to the shutdown of plants with 1,350,000 workers. — *National Safety Council.*

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BACKED BY YEARS OF "KNOW-HOW"

Whether your requirement is a few additional pieces of furniture or fully equipped new departments . . . laboratories, homemaking, art, vocational or industrial shops . . . Sheldon provides standard and modified units that are outstanding for excellence of design and construction . . . qualities that long and hard usage only serve to emphasize. In experience and facilities, Sheldon is unsurpassed; and Sheldon's record of customer satisfaction is unique.

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For LEADERSHIP!

IT'S THE DETAILS THAT MAKE THE DIFFERENCE

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The key to your complete equipment problem

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MUSKEGON, MICHIGAN

New Publications

Encyclopedia of Educational Research

Edited by Walter Scott Monroe. Revised edition, 1950; 1520 pp., list price $20. The Macmillan Co., New York City.

The revised edition of this famous reference work on educational research will be of special interest to those engaged in vocational education and in industrial arts. The new edition has been enlarged, reorganized, and brought up to date. A helpful feature is the index printed on colored pages and located in the center of the book. Published under the sponsorship of the American Educational Research Association, and edited by one of America's most distinguished research scholars in the field of professional education, this is an authoritative book on modern educational research, presenting, as it does, an account of what research in the many phases of modern education means.

High school teachers, college teachers, and college students of industrial arts and the various fields of vocational education will find this an invaluable reference on research findings and the best thinking of leaders in their respective fields of professional interest. Students working toward advanced degrees will find the following sections of special interest:

Agricultural education, business education, child development, consumer education, economic aspects of education, examinations, extension education, federal relations to education, home-economics education, industrial education, safety education, school and community, student personnel work (including vocational guidance and

(Continued on page 29A)

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YOUR APRIL ELDORADOSTAT . . .

Guard Rail Eye Nut

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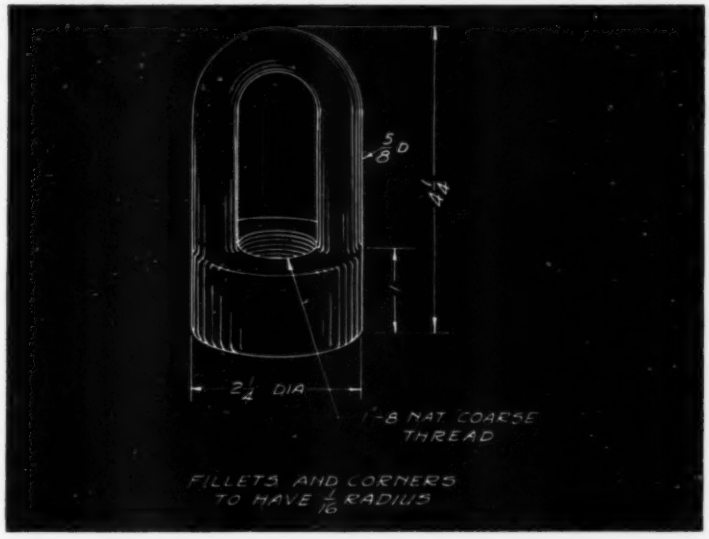
This helpful, instructive Eldoradostat Problem and Solution will be sent to you *free*. You can make as many blueprints as you need for your class.

It is particularly gratifying to find that after more than 20 years the demand for Eldoradostats is growing greater and greater every month.

Give this problem in orthographic views to your pupils. Have them do it with the same leads (2H & 3H) the draftsman used in working up the original Problem and Solution with Dixon's Typhonite ELDORADO.



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NEW PUBLICATIONS

(Continued from page 27A)

occupational placement), veterans' education, and vocational education.

This well-organized, comprehensive summary of what is known about education, is a major contribution to the profession of education.

Television for Radiomen

By Edward M. Noll. Cloth, 595 pp., 6½ by 9½ in., illus., $7. The Macmillan Co., 60 Fifth Ave., New York City.

A book for the practical serviceman as well as the technical school student. After explaining the fundamental theory, television signals are discussed, after which the general operation of the television system is explained. This is then followed by a clear setting forth of the R-F and I-F systems, video amplifier systems, television picture tubes, sync and inter-sync systems, sweep systems, F.M. sound systems, large screen and projection television, and television receiver antennas, and their installation and operation.

There also are chapters on trouble shooting, and on television mathematics.

Leathercraft: Techniques and Designs

By John W. Dean. Cloth, 251 pp., 7 by 10¼ in., illus., $5. McKnight & McKnight Publishing Co., Bloomington, Ill.

An interesting and instructive book that will delight the craftsman. It contains many helpful hints on making the necessary tools, laying out the designs, and processing the leather.

The book is divided into five parts which present the subject under leathers and tonnages, tools and equipment, processes, leather designs and patterns, and projects.

Besides the large selection of projects there are fifty plates of designs.

107 Leathercraft Designs

By John W. Dean. Paper cover, 50 plates, 5 by 10¼ in., $2. McKnight & McKnight Publishing Co., Bloomington, Ill.

An excellent collection of designs for the craftsman in leather. They are all full size, and the fifty plates contain about as many layouts as the average craftsman will ever need.

How to Make Braided Rugs

By Dorothy Altpeter with Corinne Anderson and Margaret Thostesen. Cloth, 53 pp., 5¼ by 8¼ in., illus., $1.50. Harper & Brothers, New York 16, N. Y.

An interesting book on an old art. It is well illustrated, and the explanations on collecting and preparing material, tearing and joining the strips, folding and hemming the strips into tubes, calculating length of tubing needed for braids, length of braids needed for rug, braiding, interweaving ends of braids, thinning out process, sewing braids together, tapering ends of braid, making round and oval rugs, are all written in language that is readily understood.

Electric Arc Welding Procedure and Practice

Imitation leather, 544 pp., 5¾ by 8 in., illus., $3. Hobart Trade School, Troy, Ohio.

This is a comprehensive and practical textbook on the procedure and practice of arc welding, which is of value not only to the student, but also to the welding engineer, welding operator and designer, and to the executives and supervisors interested in welding procedure and practice.

It is divided into five parts.

Part 1 discusses the development of electric arc welding, describes applications, available metals and alloys, joints and welds, electrodes, equipment, and other basic procedures.

Part 2 constitutes a complete self-study course, incorporating review summaries, practical exercises and "quiz" questions.

Part 3 describes in detail the principles and practical operations of carbon arc welding.

Part 4 covers other welding processes such as Inert-Gas-Shielded Arc Welding, Submerged Arc Welding, and Electric Stud Welding.

Part 5 reproduces the welding terms and their definitions of the American Welding Society.

The book is illustrated with over 600 photographs of operations, diagrams, and charts.

The Administration of the College Library

By Guy R. Lyle and others. Cloth, 608 pp., $5. The H. W. Wilson Co., New York City.

This new edition has been revised both in style and in the organization of the material, and numerous additions and deletions have been made in bringing the work up to date. The most important writings on college libraries since 1944 have been analyzed and their contribution is recorded in the text, footnotes, and chapter bibliographies.

The principal author is Guy R. Lyle, director of libraries and professor at Louisiana State University. His collaborators are Paul Bixler, librarian of Antioch College (author of two chapters on the selection and acquisition of materials); Marjorie J. Hood, of the Woman's College Library, University of North Carolina (chapter on circulation work); and Arnold H. Trotier, assistant director, University of Illinois library (chapter on cataloguing and classification).

Teaching Apprentices and Preparing Training Materials

By Miles H. Anderson. Cloth, 170 pp., 5⅝ by 8½ in., illus., $3.50. American Technical Society, Chicago, Ill.

An informative text for those who have to teach our future mechanics.

The 12 chapters in the book present the history of apprenticeship training; show how to operate an apprentice-training program; discuss apprenticeship in trades and industries; delineate how craftsmen can be trained to teach apprentices; enumerate the problems to be met in starting and teaching apprentice classes; show how to construct testing and rating scales; prepare and use visual aids; analyze trades for course content; and prepare instruction sheets.

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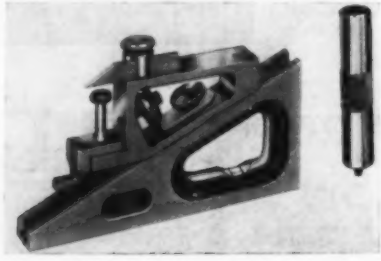
Shop Equipment News

NEW PRODUCTS — PUBLICATIONS

STARRETT UNIVERSAL PRECISION GAUGE

The new Starrett Universal Precision Gauge was designed for gauge makers, inspectors, tool and die makers, and machinists. Its fine adjustment features make possible faster and more accurate settings on a wide variety of applications.

A quick easy adjustment of the knurled thumbscrew is all that is necessary to set this gauge smoothly and to the exact size required, either from a micrometer, vernier caliper, or gauge blocks. A clamp nut locks the slide securely in place. Both thumbscrew and lock nut are smaller than the gauge thickness, permitting the gauge to be used on its sides without interference.



Starrett universal precision gauge

It can be used as a surface or as a height gauge. A new offset attachment or *foot* is also available that permits settings in narrow areas or working ⅛ in. below the base line. The 3-in. knurled extension provides an increased range of 9¼ in.

It may be used as a planer and shaper gauge, for gap measurements, face to face, etc., as an adjustable parallel, for transferring settings with indicators, on surface plates or machine platens for checking and layout, as a height gauge, as a scriber for setting up and leveling, with gauge blocks or a sine bar. In all these applications, flush surfaces permit use on base, end, top of slide, or slides.

For further information write to the L. S. Starrett Co., Athol, Mass.

For brief reference use IAVE—0401.

DI-ACRO PRODUCTS

A new valuable accessory for all Di-Acro brakes, are the precision box fingers which can be mounted on all Di-Acro brakes regardless of the date purchased. This converts them to precision box and pan brakes. They are valuable for both experimental and production operations. These box fingers can be quickly adjusted for any size box within their capacity in graduations of ⅛-in.

Di-Acro precision box fingers

Di-Acro power shears are now also available. These shears are ruggedly built precision units which will accurately and rapidly cut square,

Di-Acro power shears

rectangular, or other straight sided blanks, shear extremely narrow strips and trim edges of sheets or parts.

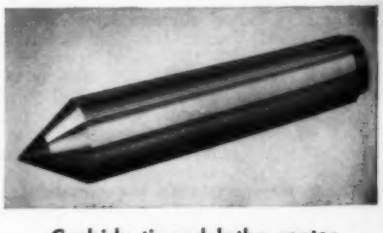
The cutting range on the Di-Acro Power Shear extends from the lightest of materials in plastics, fiber, mica, leather, and rubber to heavy gauges of aluminum, cobalt steel, chrome molybdenum, leaded brass, stainless steel, and many spring tempered materials. In all these materials, a clean cut free from rough edges or burr is assured because of the sustained accuracy built into this sturdy precision machine.

For further information write to the O'Neil-Irwin Manufacturing Co., Lake City, Minn.

For brief reference use IAVE—0402.

CARBIDE TIPPED LATHE CENTERS

Lathe centers with 60-deg. tungsten carbide tips are now being manufactured by the South Bend Lathe works for use on lathes, grinders, and other machine tools. The tungsten carbide tip is much harder than the hardest tool steel point; therefore, scoring and wear is negligible.



Carbide tipped lathe center

These centers are available with standard No. 2 and No. 3 Morse taper shanks. For additional information address the South Bend Lathe Works, 178 East Madison St., South Bend 22, Ind.

For brief reference use IAVE—0403.

NEW CINCINNATI CATALOG

The 1950 general catalog of Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio, has been published recently. It is well illustrated and describes clearly the milling, die sinking, broaching, cutter and tool grinding, precision grinding, centerless lapping, flame hardening, and

(Continued on page 32A)

Save Time • Save Money • Save Yourself

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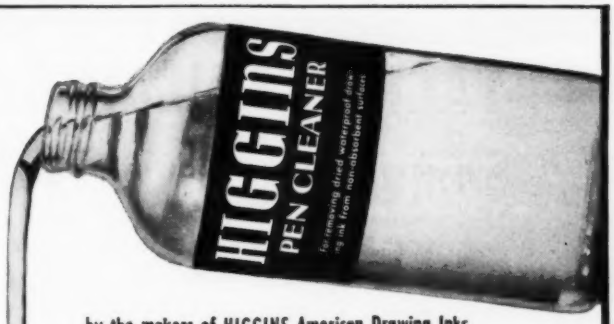
It cleans your drawing instruments when encrusted with dried waterproof drawing inks. Leaves them better than new for they are clean and "broken in." It is odorless, non-inflammable, harmless to brushes and instruments, non-injurious to skin and clothing and non-volatile.



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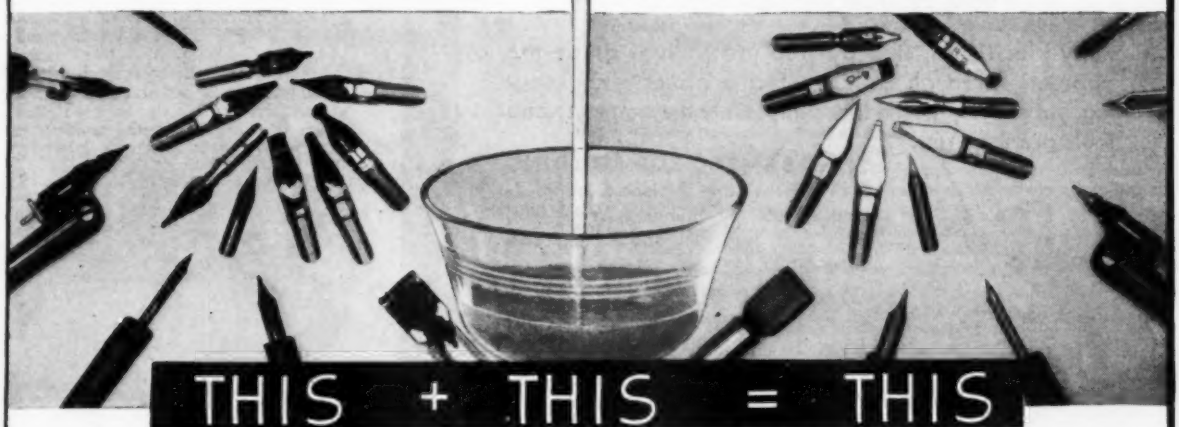

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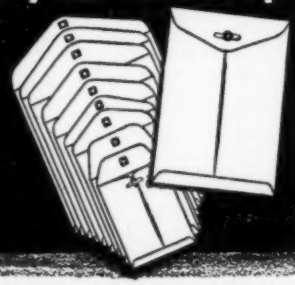

Clasp Envelopes

"A convenient means to inexpensive packaging."

When you want extra safety and additional protection for your large or bulky materials to be mailed, then you should use a Clasp Envelope. These envelopes are built of rugged, heavy stock, equipped with a burrless metal clasp, and come in a wide variety of sizes. They are used in many cases to carry heavy magazines, machine parts, steel wool, shavings, instruction manuals, photographs, cloth or fabric samples, and similar large items that require complete protection but do not call for the expense of a box container. The clasp feature permits you to insert and extract the contents several times. The clasp also allows you to send material through the mail at third class rates yet guarantees you of a protective seal.

Western stocks 22 sizes ranging from 2½"x 4¼" to 12"x 15½".

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GENERAL SHOP METALWORK

BY DRAGOO & REED. Basic text covering beginning bench metal, sheet metal, art metal and ornamental metal. Includes designs and directions for twenty-eight projects of a practical, usable nature. Includes occupational information. Contents include: safety; rectangular, cylindrical, conical layouts; tin snips; forming sheet metal; hems; wiring; soldering; riveting; lock seams; cutting, forming by machine; sheet metal; surface treating, cleaning black iron; bending, twisting iron; hammering; finishing wrought iron; gas and electric welding; drill press; smoothing and polishing; tooling and many other valuable topics. A few of the projects include: pancake turner; cookie cutter; candelabra, lamps, hammer. Write for approval copy. $1.00 Clip this.

GENERAL SHOP WOODWORKING
By Fryklund & LaBerge. Unit instruction in hand woodworking processes. $1.00

GENERAL SHOP ELECTRICITY
By Dragoo & Dragoo. Beginner's text. $1.00

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SCHOOL .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

SHOP EQUIPMENT NEWS

(Continued from page 30A)

other heavy industrial machinery manufactured by this firm.

Readers can get a copy of this catalog by writing to the address given in the foregoing.

For brief reference use IAVE—0404.

NEW DURO BAND SAW

The 1950 line of Duro band saws for work in wood, plastics, and light metals, was recently announced by Duro Metal Products Co., 2696 N. Kildare Ave., Chicago 39, Ill.

These saws are available in 10-, 12-, and 15-in. size. They are specially designed for home, farm, school, and industrial use. The new improvements include one-piece cast wheel guards which unlock with one knob and permit quick inspection of both upper and lower wheels at the same time; heavier cast iron frames for smooth vibrationless operation; ball-bearing blade guides for reduced blade wear; large, and accurately ground worktables with extensions. The 12- and 15-in. models have provision for built-in lights for illuminating the worktable. The 15-in. Duro model has the worktable slotted for working with a miter gauge.

For full details write to Duro Metal Products Company at address given.

For brief reference use IAVE—0405.

New Duro band saw

THE NEW 11-IN. LOGAN LATHE

The new Logan No. 955 11-in. lathe has a 1-in. collet capacity, 11-in. swing, 1⅜-in. spindle hole, and center distances of 24 or 36 in.

The ball-bearing mounted spindle permits speeds of 45 to 1500 r.p.m. without bearing adjustment. Typical tolerances are bedways precision ground to within .0005 in. of absolute lineal accuracy, and less than .0005 in. total runout of the spindle 12 in. from the front bearing. The lathe is mounted on a pedestal base with the underneath drive completely enclosed. The compact design of the base permits multiple installations

New 11-in. Logan lathe

in a small floor area, and saves space on single installations as well.

The steel pedestal base is recessed at floor level which permits toe room for the operator and simplifies cleaning. All control parts are conveniently placed at the operator's finger tips.

The new lathe is available in two models which are identical in all respects except center distances — No. 955, with 24-in. between centers, and the No. 957, with a center distance of 36 in.

Full information on the new lathe is available in booklet form from Logan Engineering Co., 4901 West Lawrence Ave., Chicago 30, Ill.

For brief reference use IAVE—0406.

PORTABLE HARDNESS TESTER

Rockwell hardness testing of metals is an important subject which can now be taught in the classroom with Ames Portable Hardness Testers.

Ames Precision Machine Works, Waltham 54, Mass., makers of precision bench lathes, shapers, and milling machines, early in 1947 put on the market a portable hardness tester, reading directly in Rockwell scales.

With these testers, accurate tests on round and flat stock, wire, tubing gears, and odd-shaped pieces are readily made.

The Ames portable hardness tester is small in size, weighs only 2½ lb., and is simple to use. The principle of hardness testing is easy to teach and easily demonstrated, and students readily become familiar with the many practical applications of hardness testing.

The Ames tester is furnished complete with ball and diamond penetrators, anvils for testing flat and round stock, test blocks, Rockwell conver-

(Continued on page 34A)

CORNELL UNIVERSITY

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July 3—August 12

PROGRAM IN

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Related Courses in Industrial and Labor Relations, Guidance and Personnel, Administration and Supervision

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Technical courses include all phases of shop work—Cabinet Making, Building Construction, Furniture Design, Mill Work, Boat Building Sheet and Art-Metal Courses, Forging and Welding, General Metal Crafts, Machine Tool Practices, Metal Casting, Metal Spinning, Drafting and Design.

Professional courses include Driver Education and Training, Audio-Visual Subjects, Guidance and Counseling, and Work Shop Conferences, in addition to the usual teaching methods and techniques courses.

The student may plan a program which will lead through successive summers to the bachelor's or master's degree. Approved programs carrying the recommendation of Oregon State College are accepted by all state departments of education for either a *Special* or a *General Secondary* Credential. Special leaflet on request. Correspondence invited.

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OREGON STATE COLLEGE
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Special 3 week workshop in Planning and Equipping Home Economics Laboratories.

Many selections in courses in Metalwork, Auto Mechanics, General Mechanics, Woodwork, Plastics, Graphic Arts, Drafting, Finishing, Building Construction, Electricity and Radio, in shops on the general comprehensive, general unit, and unit basis.

★ ★ ★

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SHOP EQUIPMENT NEWS

(Continued from page 32A)

Ames precision hardness tester

sion chart, and complete instructions on how to use this handy tester. A wooden carrying case for the protection of the tester and accessories is also furnished.

For brief reference use IAVE—0407.

PROTO POWER SOCKET WRENCH SETS

Three new sets of high-strength power impact socket wrenches have been added to the Proto line.

Set No. 7400C is designed for use with various makes of impact tools and wrenches. It provides six basic ½-in. drive socket wrenches with single hexagon openings of 7/16, ½, 9/16, 5/8, 11/16, and ¾ in.

Proto power-impact socket wrench sets

Set No. 7400B also has six ½-in. drive socket wrenches, but the openings range from 9/16 to 7/8 by 1/16-in. steps.

The third Proto set — No. 7400A — includes from three to six each of the sockets in the other two sets, along with a universal joint, adapter, stud puller, and four special sockets. It is intended for garages and maintenance shops.

(Continued on page 36A)

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No. 15

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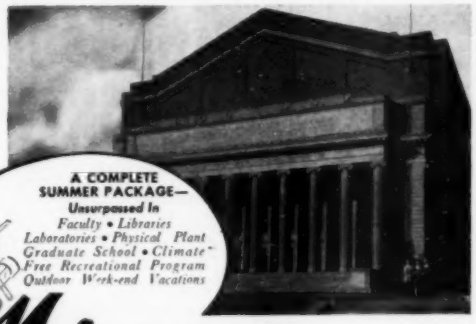
Wattage 115 Volt	Shipping Weight	Price
200 W	4 lbs.	$15.00
350 W	6 lbs.	25.00

THE ELECTRIC Hotpack COMPANY, INC.

5067 Cottman Ave. Philadelphia 35, Pa.



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SHOP EQUIPMENT NEWS

(Continued from page 34A)

For further information write to the Plomb Tool Co., 2204 N. Santa Fe Ave., Los Angeles 54, Calif.

For brief reference use IAVE—0408.

ELECTRIC HOTPACK CERAMIC KILN

The working chamber of this kiln is 15 by 15 by 16½ in., is approximately 38 in. from the floor, while the entire unit is just 5 ft. high. The three banks of heater elements are located on the back and two side walls. They permit easy replacement from the front.

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This unit may be also had with the Limitstat, an automatic shut off, and Indicating Controlling Pyrometer.

For further information address The Electric Hotpack Co., Inc., Philadelphia 35, Pa.

For brief reference use IAVE—0409.

THE NEW YATES-AMERICAN J-LINE

The Yates-American Machine Company of Beloit, Wis., has announced a new line of woodworking machines intended for use in novelty and light production plants, and in school shops. These machines will be known as the J-Line woodworking machines.

They have smooth, flowing lines which give them a pleasing appearance and make them easier to keep clean.

The J-120-20-in. band saw, illustrated herewith, has a cast-iron base and a steel frame. Motor, V-belt drive, and lower wheel are enclosed by a pressed steel covering which is insulated by rubber beading. The 24 by 24-in. table is supported on double trunnions, and tilts 45 deg. right and 12 deg. left. Hinged table section permits easy removal of blade without twisting.

The top guide is counterbalanced. All bearings are lubricated-for-life, and a convenient foot brake on the lower wheel is provided.

(Continued on page 37A)

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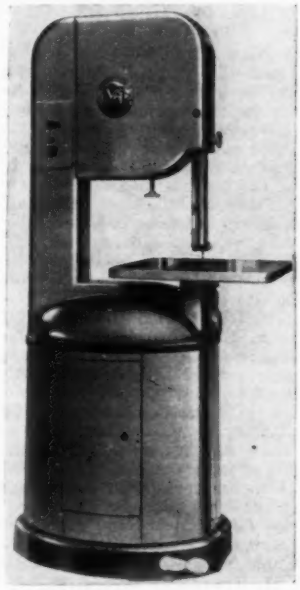
SHOP EQUIPMENT NEWS

(Continued from page 36A)



J-120-10-in. Yates-American band saw

Other machines in the new J-Line include the J-131-8-in. jointer, J-180 18 by 6-in. surfacer, J-170 12-in. lathe, J-140 mortiser, J-147-16-in. disk sander, J-145 spindle sander and J-150 shaper.

For brief reference use IAVE—0410.

THE NEW JIFFY CLIP

The new Jiffy clip is a fool and fumble proof connector for quick positive circuit construction.

Its over-all size is .051 by .187 by .520 in., and its resistance is less than one one-thousandth of an ohm.

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Jiffy clip

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For further information address Jiffy Clip, 128 Clinton Ave., Huntington, L. I., N. Y.

For brief reference use IAVE—0411.

(Continued on page 38A)

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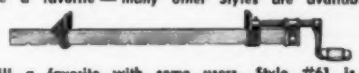

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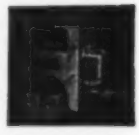

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SHOP EQUIPMENT NEWS

(Continued from page 37A)

POWER SAW FOR CUTTING SLATE-SURFACED INSULATED SIDING

A new power saw blade that can cut slate-surfaced insulating siding of the types known as Insulbrick, Brixite, Insulstone, Celo-brick, and so forth, has just been announced by the Porter-Cable Machine Company, Syracuse 8, N. Y. The blade is used on a Model A-4 Guild Saw.

This insulating material is approximately 9/16 in. thick, the body is of Celotex-like fiber impregnated with asphalt, and the outer side is faced with slate particles embossed and colored to look like brick.

With the new Porter-Cable blade, the siding is cut from the rear surface to a depth which just avoids the slate. The siding then breaks off clean.

The teeth of the new blade have no set. They are ground to a knife edge on the periphery. The blade is put on the saw with the slanting edge of the teeth leading (opposite to wood cutting). This cuts the material rapidly and cleanly and reduces gum-up to a minimum.

The blade can be cleaned while running by holding to it a piece of felt dipped in kerosene. It can be re-sharpened by holding a stone against it, also while it is running.

The new Porter-Cable blade (part No. 114-A4) can be ordered separately by owners of the Porter-Cable type A-4 Guild Saw.

For brief reference use IAVE—0412.

NEW AIRCO ALUMINUM BRAZING WIRE

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y., has announced that No. 718 aluminum brazing wire replaces No. 716.

Joints made with No. 718 wire are more resistant to corrosion, and parts required to withstand pressure show fewer leaks than with the older wire.

The No. 718 aluminum brazing wire is sold in 3/32 and 1/8-in. diameters and is immediately available. The standard package for each coil is approximately 55 lb.

It is recommened that Elite Aluminum Brazing Flux be used in conjunction with the new wire.

For brief reference use IAVE—0413.

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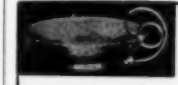

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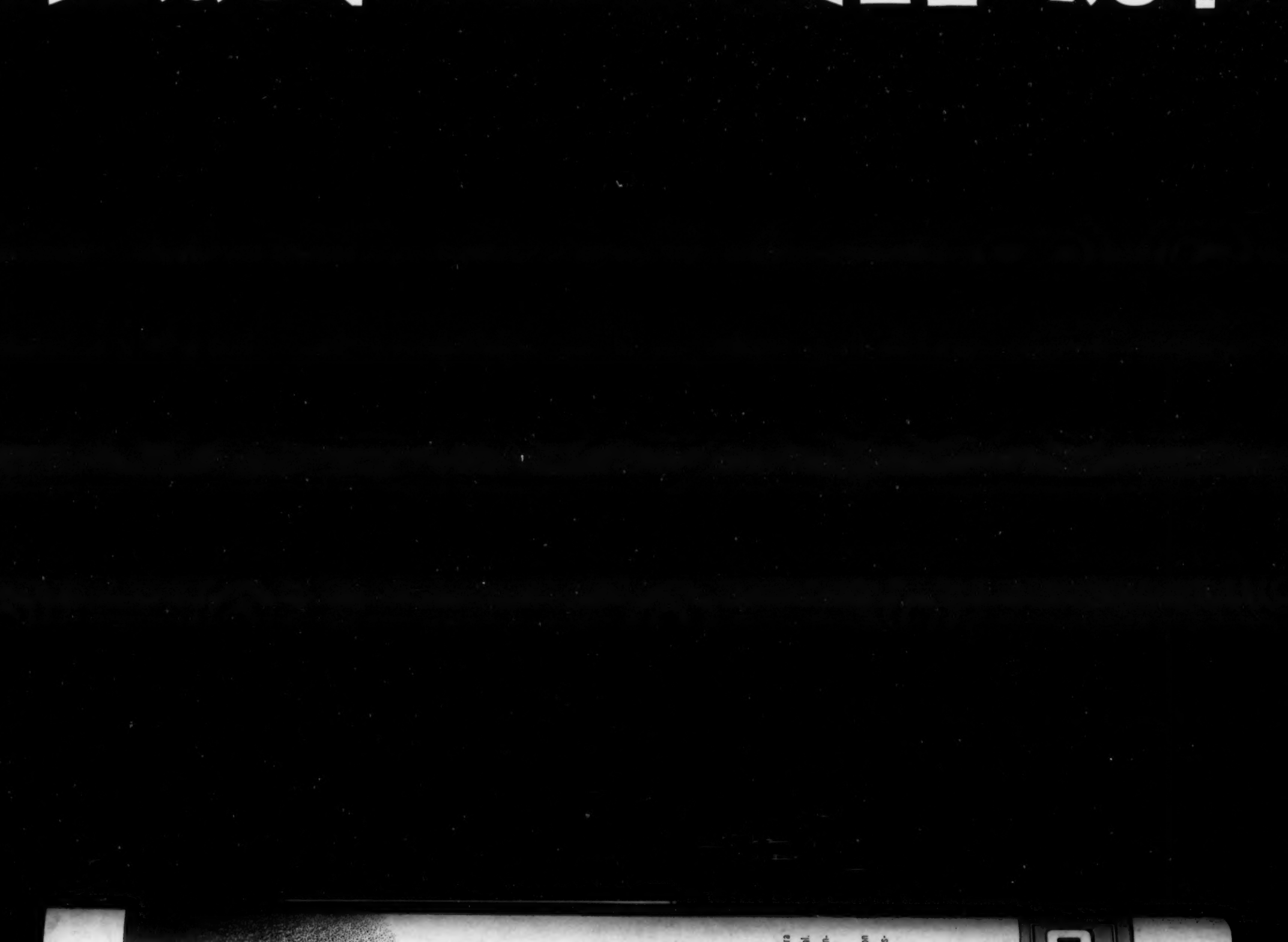
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